THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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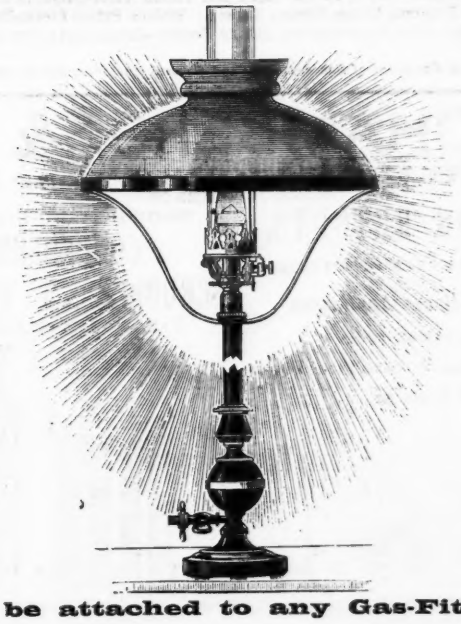

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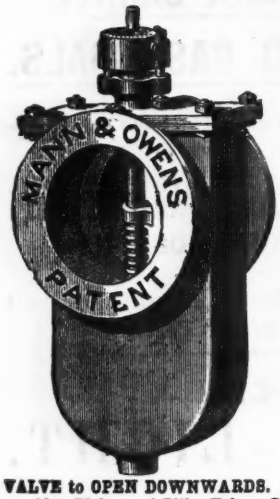

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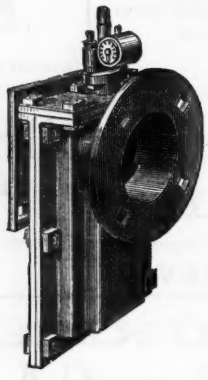

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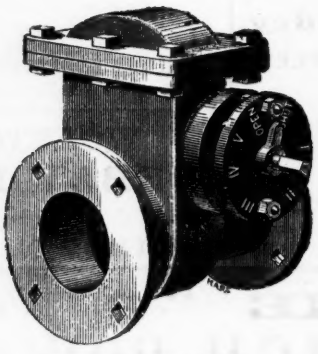

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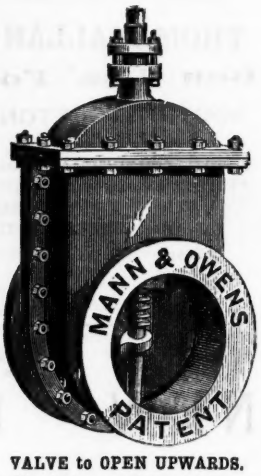

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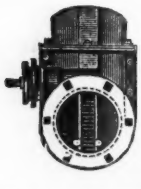

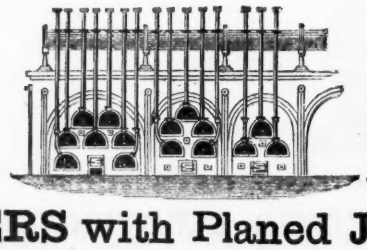

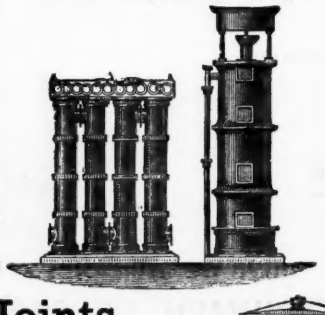

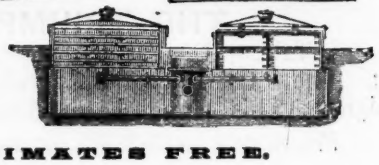

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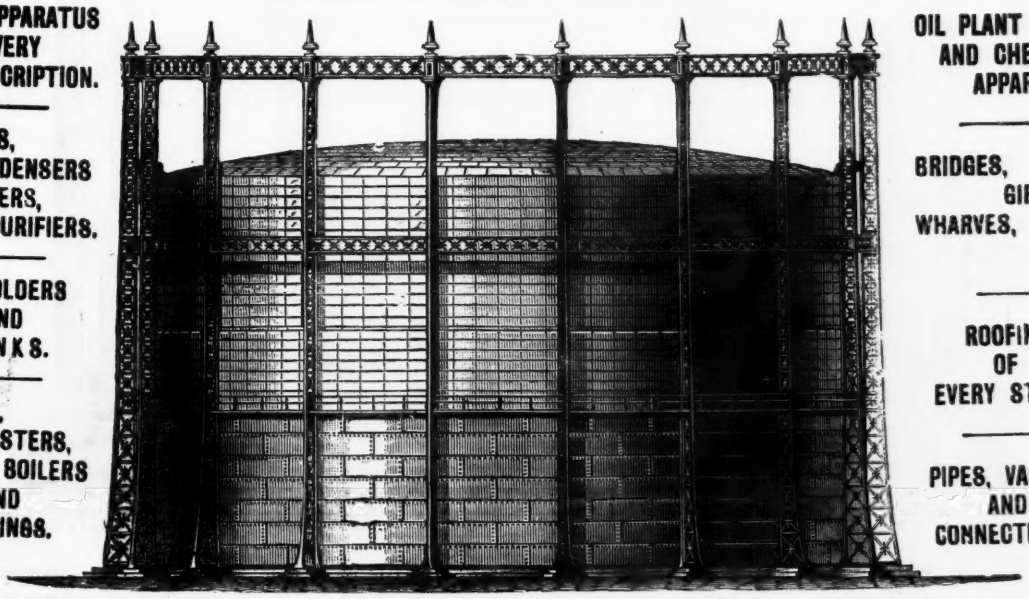

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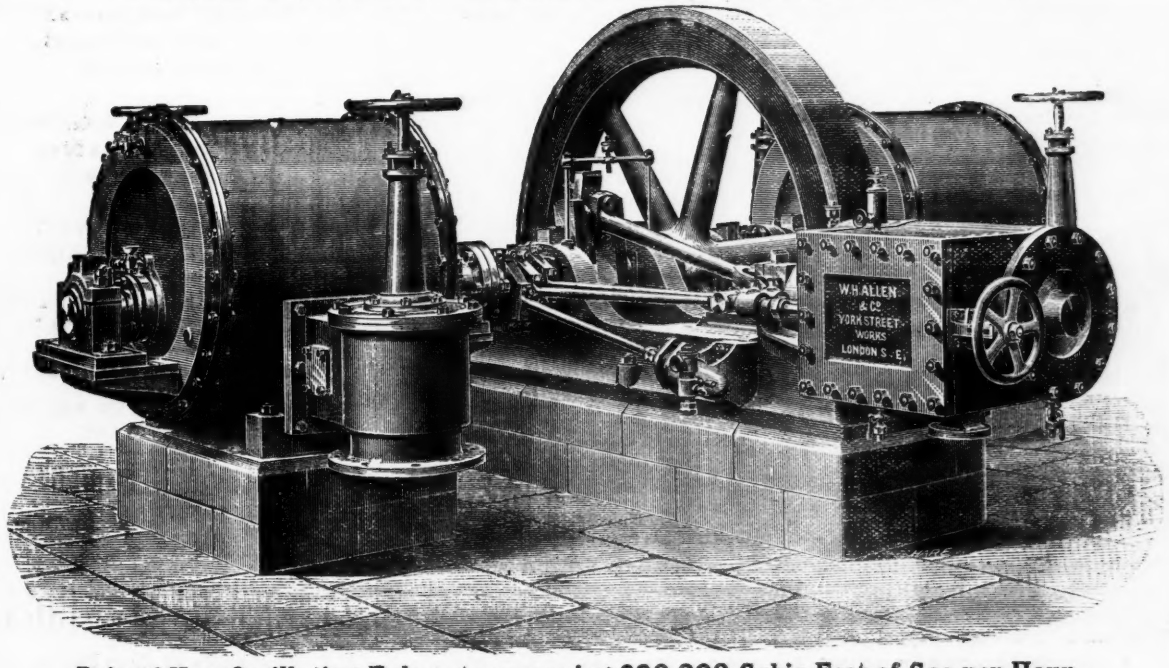

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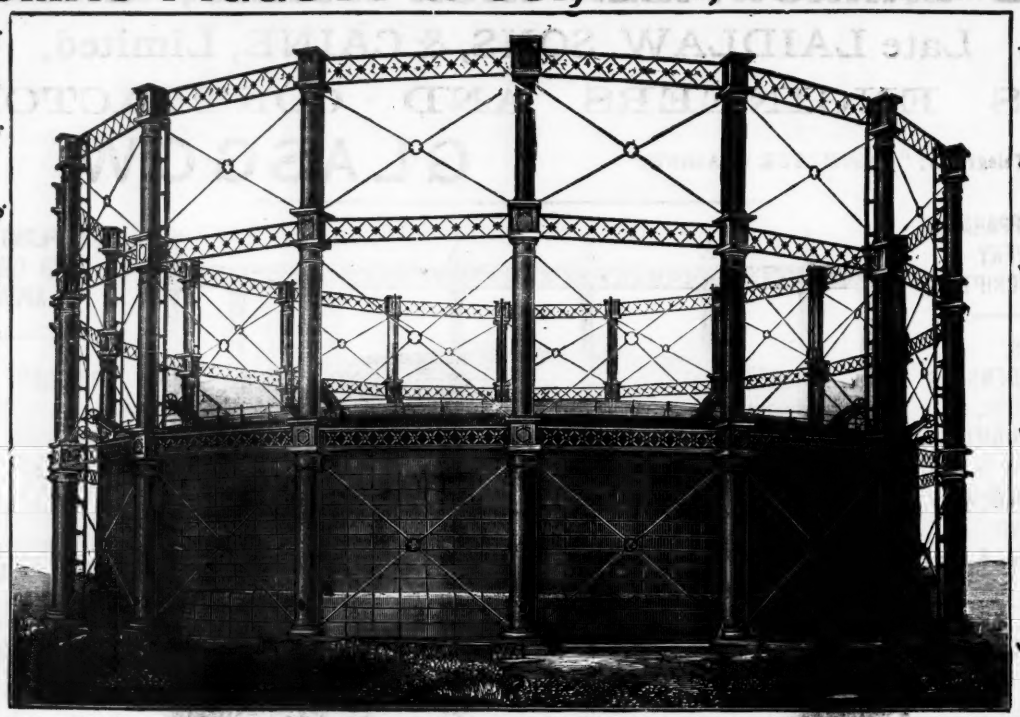

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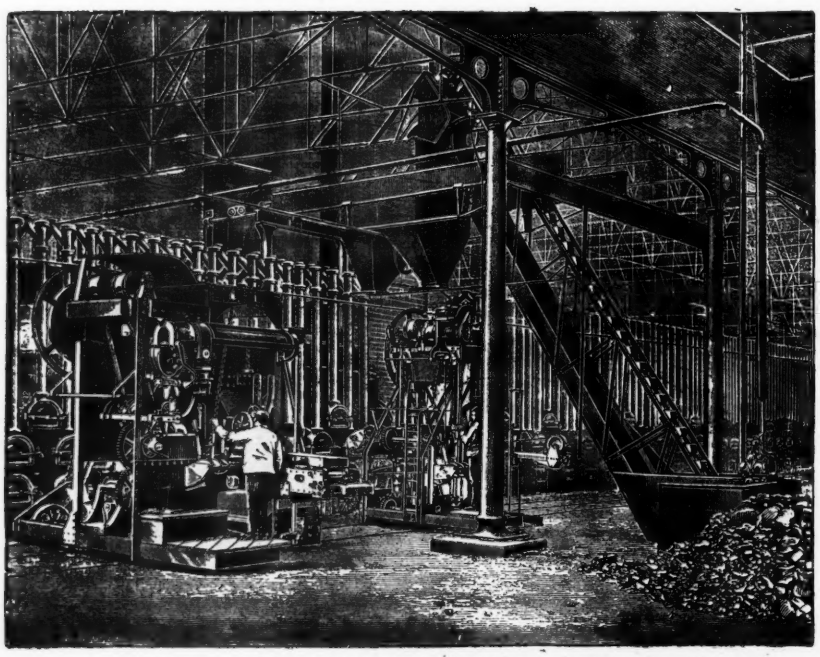

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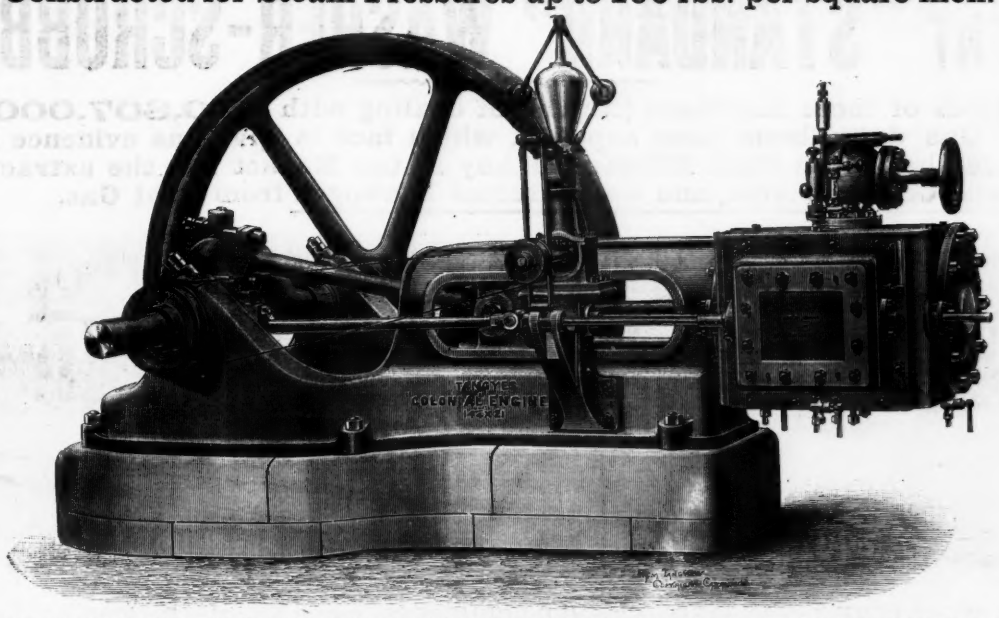

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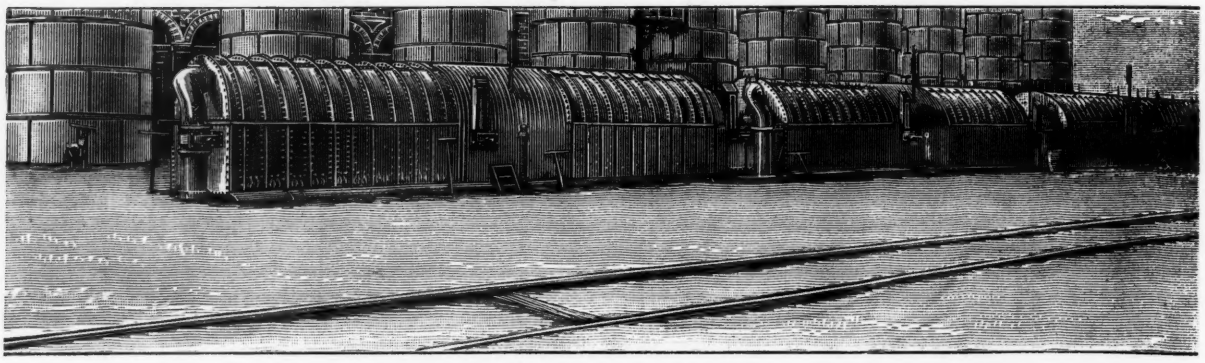

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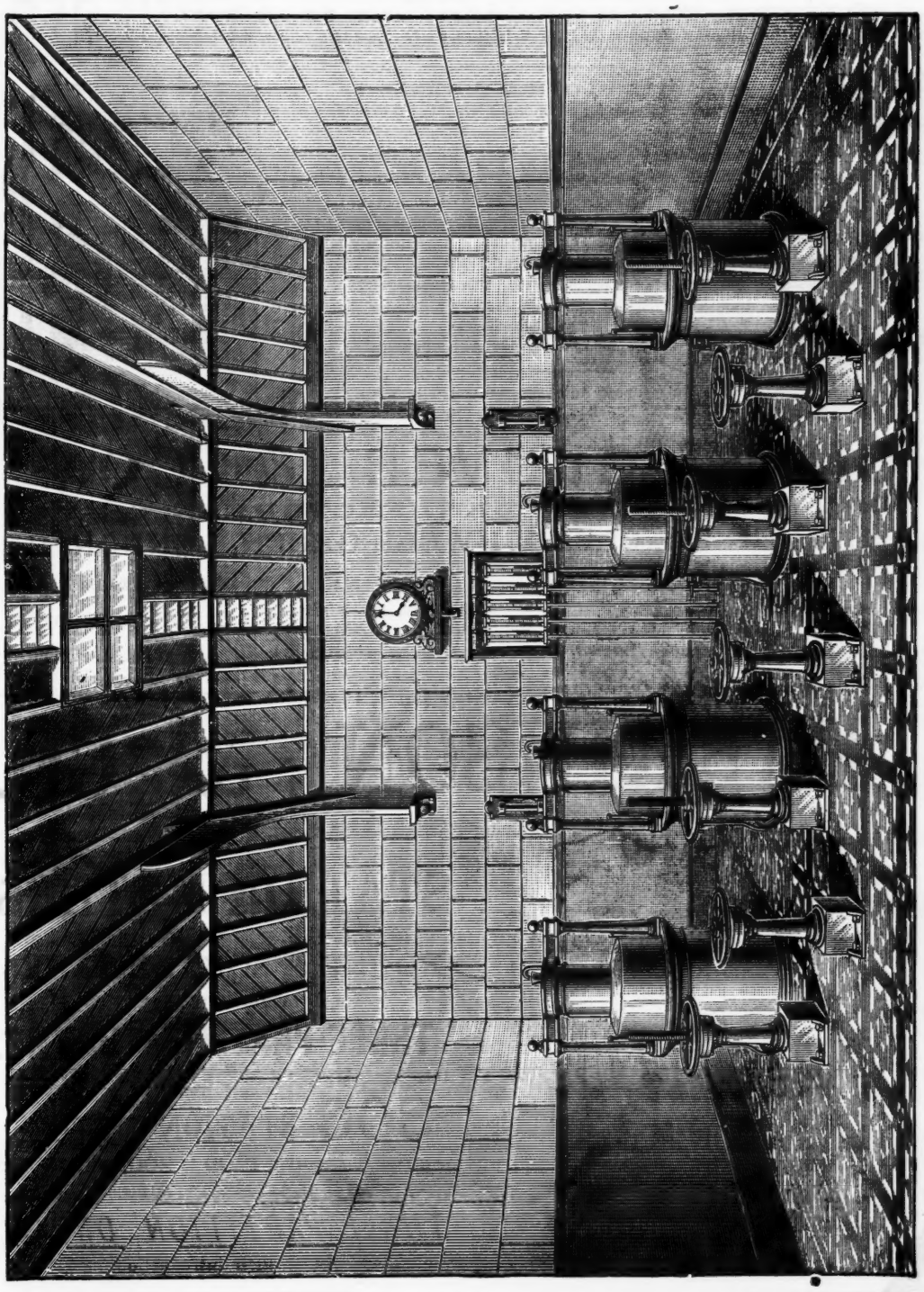

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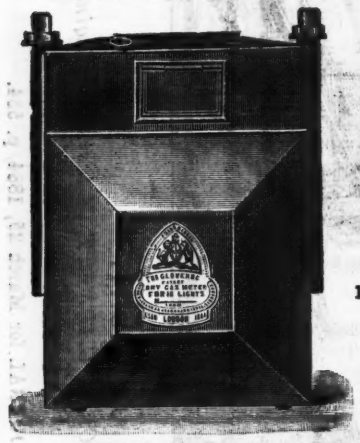

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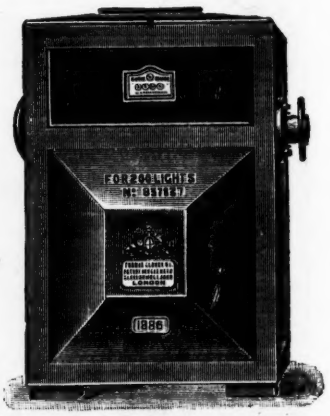

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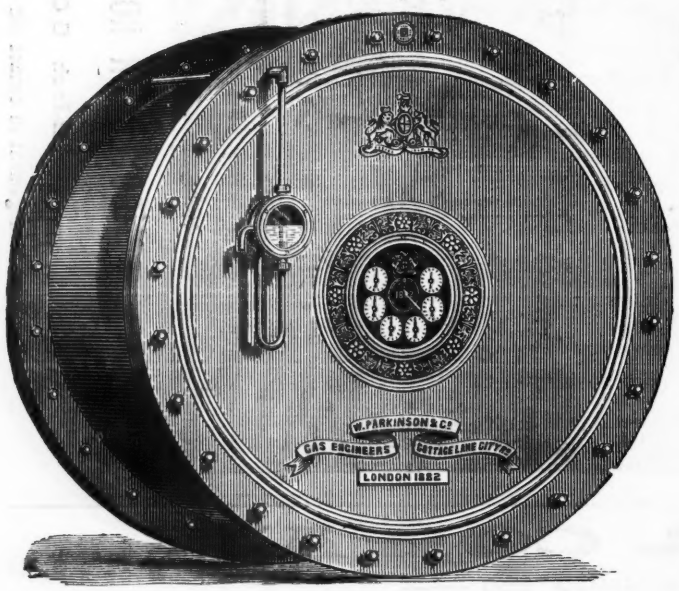

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THREE-PARTITION DRUMS.

MORE THAN

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[See also Advt., p. 196.

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The Report of the Alkali Works Inspector—An Experience in Federation 161
The Pass List in "Gas Manufacture" 162
The Threatened Miners' Strike 162
Gas-Burners and Fire-Prevention 162
Fuel Gas not Comparable with Coal Gas 163

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market 163
Electric Lighting Memoranda 163
Rules of Associations of Employers and Employed 164

TECHNICAL RECORD:—

The Heat of Combustion of the Principal Gaseous Hydrocarbons . . . 166
Austro-Hungarian Gas Association—Annual Meeting at Pressburg . . . 167
Belgian Association of Gas Managers—Annual Meeting at Liége . . . 167
Photometry at the Physical Society 168

REGISTER OF PATENTS:—

Decomposing Mineral Oils for the Production of Illuminating Gas—Young, W., and Bell, A. 169
Gas-Engines—Webb, W. le P. 170
Prepayment Gas-Meters—Anderson, J. 171
Incandescent Lamps—Fried, B. 171
Gas Pressure Regulators—Boult, A. J. (Stahlschmidt, F.) 171
Valve-Gear for Gas-Engines—Abel, C. D. (The Gas Motoren Fabrik Deutz) 171
Patent Notices 171

PARLIAMENTARY INTELLIGENCE:—

House of Lords—The London County Council General Powers Bill; Progress of Bills 172
House of Commons—Progress of Bills 172

LEGAL INTELLIGENCE:—

High Court of Justice—Queen's Bench Division—Corporation of Southport *v.* Assessment Committee of the Ormskirk Union and the Overseers of Birkdale 173
The Queen *v.* The Staines Union and the Local Board of Staines . . 173
Official Referee's Court—Wellby *v.* South Metropolitan Gas Company . 173
Westminster County Court—London County Council *v.* Vestry of St. Luke's; The Repair of Fire Hydrants 174

MISCELLANEOUS:—

The Examinations in Gas Manufacture—The Pass List 175
The Crisis in the Coal Trade 175
The Annual Report of the Chief Inspector under the Alkali Act 176
Meeting of the European Gas Company, Limited 178
Meeting of the Para Gas Company, Limited 179
The Proposed Amalgamation of Water-Gas Companies—The Scheme agreed to by the British Water-Gas Syndicate 180
The Electric Light Question at Croydon 180
The Electrolysis of Gas and Water Pipes 181
The Early History of Wrought-Iron Gas-Pipe 181
Sulphate of Ammonia as a Manure 182
The Leeds Water-Works 182
Notes from Scotland 183
Current Sales of Gas Products 184
Coal Trade Reports 184
Gas and Water Companies' Stock and Share List 185

PARAGRAPHS.—Election of Mr. J. Lowe to the Weymouth Town Council, 163—The Supply of Water for Fire Extinction, 166—A Large Wire Rope, 167—Micro-Organisms in Water, 167—Death of Mr. John Head, 167—The Gaslight and Coke Company, 168—Death of Mr. W. T. Evans, of Cardiff, 168—Death of Mr. John M'Gillewie, of Perth, 168—Mr. John Mackay, 168—The Gas, Water, and Electric Lighting Companies' Directory, &c., 168—Incorporated Association of Municipal and County Engineers, 168—Buenos Ayres (New) Gas Company, Limited, 171—The New Water Supply for Newark, 172—The Financial Position of the Stratford-upon-Avon Water Undertaking, 172—The Price of Gas at Rawmarsh, 172—The Electric Lighting Scheme of the Manchester Corporation, 174—Jones *v.* Conway and Colwyn Bay Joint Water Board, 174—Shrewsbury Water Supply, 174—The Electric Lighting Nuisance at Morecambe, 174—Gas, Water, and General Investment Trust, Limited, 176—The Use of the Divining-Rod in Searching for Water, 176—The Recovery of Water-Rates for Small Houses, 176—Exhibitions of Gas Appliances, 178—Value of a Water-Pipe Rental, 180—The Water Supply of Temple Newsam, 180—The Gas Coal Contracts of the Leeds Corporation, 180—The New Gasholder at Salisbury, 182—The Position of the Employees of the Birmingham Corporation, 184—The Public Lighting Question at Grimsby, 185—Colne Valley Water Company, 185—Rival Water Schemes at Glossop, 185.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 25, 1893.

The Report of the Alkali Works Inspector—An Experience in Federation.

THE report of the Chief Inspector under the Alkali Works Regulation Act, an abstract of which appears in another column, does not this year contain very much matter specially interesting to gas manufacturers. There is, however, a good deal in it that may be considered both interesting and instructive to anybody who is connected, either directly or indirectly, with chemical industries in general; and it constitutes a very handy census of the national manufactures of which it treats. Students of industrial economics will also find in the pages of Mr. A. E. Fletcher's report a great deal of matter for reflection, inasmuch as these supply valuable evidence respecting the effect on a great industry, such as that of alkali manufacture, of that system of "syndicating" previously independent establishments which is so marked a tendency of the age. It is stated that the union of the principal alkali manufacturers in one concern has brought about considerable changes in the various works. "A wholesome competition has been established among the Managers; and "the Directors, having the detailed reports before them, "have been able to make exact comparison between the "different systems of management and working. All "that was best, in the practical details of manufacture, "though found in practice possibly in one of the smaller "works, has been adopted in all; and those which were "proved, on strict comparison, to be wasteful, have been "abandoned. Thus a system of selection has been carried on, which has operated more rapidly, and by a less "painful method, than Nature's process of the survival of "the fittest." The best works managers have found promotion, and are guided from head-quarters, which secures uniformity of method. An excellent central laboratory has been established under the management of an eminent chemist, aided by a staff of able assistants. There all new materials and processes are tested and examined; and the centralization of control, while doubtless resulting in economy work, has afforded an "additional guarantee "for the complete observance of the provisions of the "Alkali Act."

Here speaks the Inspector; but the preceding observations, in which Mr. Fletcher so enthusiastically describes the results of the fusion of interests in the Alkali Union, appear to come from the heart of a chemist and trained observer of the working of the industrial world. It will occur to many readers of these observations that they breathe the spirit of practical Socialism—not the Socialism that would abolish all commercial competition, together with all money, from the world; but that more intelligible principle which aims at the reduction of waste, the diminution of trade friction, and the concentration of effort by the federation of workers in the same line. Call it a "syndi-"cate" if the term happens to suit the system—who wishes to squabble over names? We have never in these columns opposed the idea of the union of producers for the regulation of trade and the suppression of cut-throat competition. It is therefore with particular pleasure that we receive this independent testimony to the happy results of the realization of this idea in regard to the alkali trade. It is necessary to remark, however, by way of caution, that the success of the system depends wholly upon the way in which it is worked. Mr. Fletcher tells of a great industrial Union that has been effectually formed, in a Free Trade country, and without any aid from legislation. But how has it been achieved? Simply by the force of brain power acting through supreme commercial, technical, and administrative skill and experience. Does anybody imagine for a single instant that an ordinary board of directors, representing in the abstract money-bags and respectability, and in the concrete an amiable desire to participate in the direction of any joint-stock enterprise that can be depended upon for fees, would have been competent to carry out such an operation? Would any committee of busybodies constituting a local authority have been able to do it? And how long might the Union be expected to endure after the powerful men at its head had given place to nonentities of either of these two common classes? Mr. Fletcher says that in the Union the best practice in manufacture makes its way, and the ablest managers get promoted. Why? Because the reins of administration are in the hands of men who know their business, and also know what is good when they see it. We are not acquainted with the secrets of the Alkali Union; but we venture to declare that, if the salaries of the head men were reported, these would be found to be calculated on a scale that would frighten a town councillor. Supposing, for the sake of the argument, that the Alkali Union men were "nationalized," or "muni-"cipalized," or in any way brought into subjection to the "progressive" gentlemen whose cardinal principle seems to be that "Jack is as good as his master," what would be the result? We should hear of "economies" being effected here, and of "savings" there; certain "monstrous" positions would be abolished, and the heads of departments would be so hectored about the great iniquity of

"one man rule" that they would go where they might hope to be better appreciated. And then the Alkali Union would go gracefully into liquidation, being only a manufacturing concern; or, if protected by law, the price of the product would be raised, and a rate-in-aid would be brought in to balance its accounts.

Mr. Fletcher has something to say about sulphate of ammonia works; and he remarks that the increase of this trade is watched with very special interest, because the ammonia itself is only obtained as a bye-product of other industries, not having yet been produced commercially by any direct process. He gives the gross output of sulphate for the United Kingdom as very nearly 150,000 tons for the past year, of which by far the greater portion, amounting to nearly 111,000 tons, came from gas-works. The production from iron-works was just 10 per cent. of this quantity, and that of shale-oil works amounted to 23,105 tons; being a falling off as compared with the return for the previous year, which is attributed to the slackness that has been experienced in the paraffin trade in consequence of the increasing importation of foreign mineral oil. Coke and coal carbonizing works are credited with the production of nearly 5000 tons of sulphate, as compared with 2766 tons for the previous year; thus showing that this branch of the industry has made a fresh start.

The Pass List in "Gas Manufacture."

In another column will be found the list of candidates who have passed the last examination in "Gas Manufacture" held by the City and Guilds of London Institute. It is with great pleasure that we have once again to record the gratifying circumstance of the First Prize in the Honours Grade, with the accompanying Silver Medal of the Institute, being taken by the inheritor of a name well known in the gas engineering profession, and we accordingly offer our heartiest congratulations to Mr. Charles Frederick Botley upon his success. The Silver Medallist for 1893 is assistant to his father at Hastings, whither he removed from Swindon; and it is due to him to mention that five years ago he was head of the Ordinary Grade pass list, so that he has now rounded off his record as double prizeman and medallist. We trust that these triumphs of the examination-room will prove the auguries of a successful and happy career. Several other familiar names appear in the list, which is eminently satisfactory for several reasons. It testifies to the facts that the examinations are attracting the right kind of candidates, and that a systematic gas-works training is necessary to success. It shows also that the best class of students of gas engineering are no longer content to rest their hopes of obtaining appointments upon testimonials supplied by friends and upon family interest. These aids are still valuable, of course; but it is becoming increasingly evident year by year that a certificate of the City and Guilds of London Institute constitutes a very valuable, because thoroughly independent, recommendation for a young man aiming at the position of a gas manager.

The Threatened Miners' Strike.

The past week was punctuated, so to speak, by a variety of reports relating to the crisis in the coal trade of the Federation district. As the matter now stands, it appears that the miners have refused to submit to the reduction of wages proposed by the employers, and that the district, as *The Times* puts it, is "about to suffer all the misery and "impoverishment necessarily attending a general strike." We may be in error, but we cannot believe that this will happen, for several reasons. In the first place, the men's leaders, with Mr. B. Pickard, M.P., at their head, have not put the facts fairly before their constituents, and have been playing their cards with a feverish anxiety that does not look much like winning. Their position is seriously weakened by the refusal of the miners of Durham and Northumberland to co-operate with them; and the gravity of the situation is brought into prominence by the circumstance that, while at their conference in Birmingham the Federation delegates refused to accept the reduction, they passed a resolution to the effect that any districts which have already submitted a diminution of the rate of wages should forthwith give notice for an advance. This is downright nonsense. The men who have already had their wages cut down, by the influence of a falling market, are not at all likely to sacrifice the "half loaf" which is proverbially better than "no bread," in order that the rash officials of the Federation may be supported in their irreconcileable attitude. That there must be a "climb "down" by the latter is the irresistible conclusion to be drawn from the well-reasoned, temperate letter which Mr. A. M. Chambers, of the Thorncliffe Iron-Works and Collieries, has sent to *The Times*. This letter convicts Mr. Pickard of a misstatement that cannot fail to damage his cause. It has reference to the meaning of the "25 per cent." reduction proposed by the masters. This proposal must have been badly reported at the time it was made, because we, and probably many other outsiders, received the impression that it meant a reduction of one-fourth in the rate of miners' wages. Mr. Pickard has pounced upon this interpretation, and the vote of the delegates at Birmingham was virtually taken upon it. According to the authoritative statement of Mr. Chambers, however, no such proposal has been made. It is customary to reckon the pit wages in percentages of increase over a standard, which for present purposes is the rate paid in 1888. Since that period wages have risen 40 per cent.; and all the masters ask is that the men should give up 25 per cent. of this increase, which would still leave an improvement of 15 per cent. on the standard of 1888. Referring to the prices of coal, this demand is seen to be reasonable, for the average selling prices are not more than 6d. to 1s. per ton in excess of those ruling in 1888. Not all the Federation oratory that can be brought to bear can make the facts appear differently, or absolve the Federation leaders from the reproach of advising a strike in face of hopeless odds. As usual, Mr. Pickard has declared that the coalowners have "given them-"selves away" to the Gas Companies, by underbidding each other for contracts, which has led them to try and make the miners suffer for their folly; but Mr. Chambers has no difficulty in showing that the prices at which gas coal contracts are closed are beyond the control of the coalowners, and are governed by the law of supply and demand. The task which the Federation leaders have set themselves is to resist a net reduction of less than 20 per cent. in wages in the Midland district, while wages in South Wales have gone down 47½ per cent.; in Durham, 15 per cent.; in Northumberland, 17½ per cent.; in the Federation district of Cumberland, 20 per cent.; and in Scotland, from 40 to 50 per cent. They say they have plenty of money to spend upon the attempt; and if they waste it in this way they will be in the same condition as the Durham miners after they had emptied their Society's exchequer in a similar cause—that is, glad to resume work at a lower rate of pay than they struck against, and helpless in the face of any ulterior action by the masters.

Gas-Burners and Fire-Prevention.

Some sensible remarks respecting the precautions that should be observed in fitting houses with gas, with regard to fire risks, are contained in a report made by Mr. C. J. Hexamer to the Franklin Institute of Philadelphia. According to statistical tables prepared by Mr. Hexamer, gas does not figure very conspicuously as a cause of fire in American cities, which is somewhat remarkable, seeing how frequently it is accused of doing mischief in the unignited state. Writing of ordinary internal fittings, Mr. Hexamer remarks that swing brackets are largely responsible for fires in dwelling-houses, and should, as far as possible, be done away with. Yet, as a matter of fact, we suppose that in America, as in other parts of the world, the swing bracket is the trade article in greatest demand by consumers. Seeing how little the swing joint of most brackets is used, it should be a point of intelligent gas-fitting practice to replace these appliances with stiff brackets wherever possible. Mr. Hexamer lays great stress upon the importance of a main-cock which cuts off the whole supply, and to which any member of the household can have ready access; but surely this necessary attachment is no more frequently omitted in American houses than it is on this side. It would have been more to the purpose if the writer had added the weight of his authority to the counsel against nightly turning off the main-cock, which is a bad habit that is still persisted in by old-fashioned people everywhere. Mr. Hexamer draws attention to the circumstance that every gas-burner in a house forms by its heat, no less than by its flame, the centre of a sphere of danger, from which all inflammable substances must be kept away. He declares that no gas-burner should be at a less distance than 36 inches from a ceiling; and when nearer than this, there should be a

metallic screen, with an air space above it, between the flame and the inflammable substance. He strongly recommends the larger use of wire globes, such as are commonly employed in theatre lighting, to protect gas-burners; remarking that if these were made of "brass in beautiful "designs," they would be rather ornamental than an eyesore. It is scarcely likely, however, that fancy wire gas-globes will become a stock article of gas-fitting in consequence of this expression of opinion. It is a pity that, while he was dealing with the subject, Mr. Hexamer did not refer to the desirability of using none but governed burners in a house, from the point of view of safety from fire. Many fires have been caused by flaring gas-burners. This is an evil which wire globes cannot cure, but which will never occur with a governed burner. Also, in many instances, unintelligent gas-fitters will be found to have supplied consumers with burners absurdly disproportioned to the service required of them. It is not in all cases possible to keep gas-burners in corridors, &c., at a distance of 36 inches from the ceiling; but burners in such places can always be governed down to a safe size of flame, which is much better than allowing the degree of safe turning down to be decided by the not always infallible judgment of the average domestic.

Fuel Gas not Comparable with Coal Gas.

In another column we have noticed and discussed a proposal offered in the pages of our contemporary the *Electrical Review* for the systematic employment of gas-engines for district electric lighting. It is unnecessary to say anything more upon the subject here; but we must take this opportunity for commenting upon a statement that occurs in another part of the same article respecting the comparative cost of driving engines by town and producer gas. Our contemporary cites a case in which certain dynamos were driven by engines supplied with town gas costing 2s. 10d. per 1000 cubic feet, when the cost of the electricity did not come to more than 3d. per unit, all told. This is commended as an example of economical running, as compared with the working of steam plant, although it is not put forward as the best that can be done with gas power, "for," says our contemporary, "it is well established that "no large central station designed to use gas plant would "do otherwise than manufacture its own gas, and it would "be, we imagine, a poor producer which could not turn out "gas at a less cost than 7d. per 1000 cubic feet. On this "basis we might make some astonishing calculations by "a simple arithmetical process, which would bring the "cost of a unit to an absurdly small figure, though there "would be extra depreciation and attendance on the gas "plant to add to this. Such calculations, however, would "scarcely serve a useful purpose." Most certainly not, we should say, if, for the sake of getting up a picturesque statement, producer gas were to be taken as of equal calorific value to coal gas, as the passage seems to imply. It is a good producer gas that shows a composition 50 per cent. combustible. Engines will work fairly well with gas containing only 28 per cent. of combustible, and representing only about 70 per cent. of the calorimetric value of the coal. This gas will just ignite cold, and possesses not more than one-third the calorific power of ordinary purified coal gas. It is worth making, to be used on the spot for driving an engine; but it is not good enough to be distributed through mains for any purpose, as the failure of all the fuel-gas companies ever started amply demonstrates. No selling price can therefore be stated for this kind of fuel, which, as the cookery-books say of certain uncommon dainties, is "seldom bought." The only correct way of expressing it is in terms of the weight of coal gasified per horse power—comparing, that is to say, the gas-producer with the steam-boiler rather than with illuminating gas. Nobody wants to know the quantity of gas made by a producer. A meter is out of place in this variety of gas-making plant; but an account of the fuel weighed in is very much in order. We desire to make it plain that we have no quarrel with our excellent electrical contemporary, which will be sure to see the point of this correction.

Election of Mr. J. Lowe to the Weymouth Town Council.—A vacancy in the Weymouth Ward of the Weymouth Town Council brought forward three candidates for the seat—one being Mr. James Lowe, Engineer and Secretary of the Weymouth Gas Company. The burgesses gave expression to a decided preference for this gentleman, who was elected by an overwhelming majority.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 185.)

The extreme weakness and depression which prevailed on the Stock Exchange a week ago, was even intensified during the week just closed. It opened quite as bad as it had concluded on the preceding Saturday, and went still from bad to worse. The American Market was the focus of disturbance. Distrust and apprehension caused forced sales, and stocks were thrown upon the market freely. The crisis was reached on Wednesday, by which time prices had been reduced to such a level that a slight reaction almost inevitably set in. Some moderate purchases caused a rally; and the fall was checked for the remainder of the week. Things remained, however, in an exceedingly delicate and uncertain condition; and they are bound to continue so until this week's settlement is over. Bad as the previous settlement was, this one is expected to be as bad, looking to the almost certainty of several failures being announced. The Money Market is firmer, in view of a probable demand from the United States; and rates are hardening. The Gas Market again presents a forcible contrast to the various other departments referred to—quietly pursuing the even tenor of its way, and unaffected by the convulsions which agitate so many who are less favourably situated. Business remains quiet, but prices are very steady; and the general tendency would seem to be in an upward direction, despite a nominal fall in a leading issue. Gaslight "A" was only moderately dealt in, but was disposed to improve; the later prices obtained being well above the opening figures. The dividend will be maintained at the same rate as last half year, carrying forward about the same balance. The debenture, preference, and limited issues were firm and quiet. South Metropolitan affords the only instance of a fall in quotation; the "B" being a point lower. Recorded transactions, however, show no falling off. Commercials were quiet; but the new stock was in demand at advanced figures. Suburbans and Provincials were almost stagnant, and quotations did not move. The Continental undertakings were also little dealt in, but were steady—European showing a slight advance. None of the rest offered any noteworthy feature. The Water Companies were quiet, especially towards the end of the week; but the general tendency was favourable, and most issues show a moderate advance in value.

The daily operations were: The market opened very sluggishly on Monday, and remained inactive, though generally firm. European part-paid improved ½; but South Metropolitan "B" fell 1. Tuesday's business was not more active, and prices were middling. Lambeth Water rose 1. The prevailing quietude lasted through Wednesday; and the only change was a rise of 3 in Commercial new. There was just a shade more activity on Thursday; but not much. Nothing moved in Gas; but in Water, East London rose 2, and Grand Junction and Southwark, 1 each. On Friday, prices in Gas stocks were rather higher, though quotations did not move. Lambeth Water was 1 better. Saturday's business was well up to the low average of the week; and prices maintained their position. Chelsea Water rose 2.

ELECTRIC LIGHTING MEMORANDA.

The Parliamentary Committee on Electric Powers (Protective Clauses)—The Croydon Electric Lighting Scheme Hung Up—A Curious Scheme for Suburban Electric Supply.

The Joint Committee of the Lords and Commons on Electric Powers (Protective Clauses) have reported in favour of inserting a clause in all Bills and Provisional Orders authorizing the use of "large electric currents for other than electric lighting purposes," requiring the undertakers to employ either insulated returns, or uninsulated metallic returns of low resistance, and also to take all reasonable precautions in placing and working their undertaking so as not to injuriously affect, by fusion or electrolytic action, any gas or water pipes. The clause may be modified in form to meet the circumstances of particular cases; but the idea is to make the users of "large currents" of electricity responsible for all damage done by induction or earth leaks. If the provisions of the clause of the regulations issued to the same effect by the Board of Trade are broken, the offenders are to incur a penalty of £10 for any such offence, and in the case of any continuing offence to a further penalty of £5 per day; and they are liable to be suspended from using electric power. The Committee explain that, on the evidence laid before them, they formed the opinion that it is not, in the present state of electrical science, to the interest of the public to insist upon electrical tramways using an insulated return conductor, and that such insistance would retard the development of electric traction. On the other hand, it was represented that uninsulated return conductors are liable to cause mischief by leakage and induction to telephone circuits, railway signal telegraphs, and gas and water pipes. With regard to the first two sufferers, the Committee remark that they can be protected by using insulated returns on their own account; while the danger of fusion and electrolytic action appears to the Committee to be due to a faulty system of constructing electric

tramways, and to be capable of reduction to a practically negligible quantity by improved methods of construction. The Committee throw upon the Board of Trade the responsibility for making regulations to secure the best system of working electric tramways and railways, having regard to the expense involved in carrying out such regulations, and to their effect upon the commercial prospects of the undertaking; and the Committee put upon record the apprehension with which they would regard a large extension of the system of overhead wires in crowded centres. This is a hint to place all telephone wires underground. The Committee discussed, but did not agree to a recommendation that, upon application by a gas or water company, the undertakers should be required to connect, at their own expense, the negative pole of the generating machine to any system of metallic pipes in the neighbourhood, or, if such connections had been already made, to remove them.

Mr. W. H. Preece's scheme for the electric lighting of Croydon by the Corporation, after having been tinkered at and brought a second time before the Town Council, has been "hung up" indefinitely. The Council were equally divided upon the resolution to proceed with the project; and the Mayor very prudently declined to give a casting vote. So far as we are concerned, the result is satisfactory as an indication that our policy of exposing the "seamy side" of electric lighting ventures is productive of good; for the data with which Alderman Layton demolished the pretensions of the advocates of this piece of speculation for Croydon were all drawn from our columns. Moreover, it is "pretty to see," as Samuel Pepys would put it, how at last the mellifluous Mr. Preece is being found out. When it comes to being accused by a Croydon Town Councillor of indulging in "pulpit eloquence," it must dawn upon the perfervid electrician to the Post Office that his peculiar vein of electric light advocacy is getting worked out. Croydon is to be felicitated upon having men in its Corporation who are able to prick such bubbles as Mr. Preece has a knack of blowing, who have strength of mind to protect the ratepayers from being victimized in the name of "progress," and to whose clear common sense the idle talk about the "light of the future" has no charm.

Our contemporary the *Electrical Review* has had a good deal to say of late concerning the advantages of gas power for central station electric lighting, which, it argues, have not been sufficiently recognized by electrical engineers. In a recent issue, the subject is discussed at considerable length, with a view to presenting a definite scheme for town lighting by electricity generated by gas power. The idea is put forward of a suburban area having a frontage of (say) 1000 yards in length, containing twelve or fourteen good-sized houses, assumed to be "willing to take a supply of electricity." Here are two rather "steep" assumptions to begin with; for we fancy a strictly suburban electric lighting company, like the Notting Hill concern, would greatly like twelve or fourteen good customers per 1000 yards of main, if they could be had. However, if one were to criticize every electrician's estimate from the beginning in this way, it would be impossible to get on. Our contemporary proceeds to suggest that "about the centre of these houses a building might be erected not more imposing than an iron one"—which would, of course, be hailed as an addition to the attractions of the neighbourhood. In this supposititious house could be placed "twelve gas-engines driving twelve dynamos; the policy being to have a separate dynamo and engine for each house. A gas-engine would then only need starting when the house indicated by telephone that light was required." A grand plan, this; especially when the inmates of any house wanted a few lights in a hurry or for a few minutes. It is conceded that during the hours of least demand one gas-engine and dynamo could supply the whole of the houses; but why the same method of working such a central station as is practised in other cases could not be adopted, is not clear—except it is contemplated to save the exaggerated cost of a switchboard. The point that is specially urged is that "the gas company should erect the gas-engines at their own cost, and which would remain the property of the gas company. Then the tenants of the twelve houses might combine for the purpose of erecting the purely electrical part of the work, the gas company could supply a man or two for the pupose of keeping the station, and would charge accordingly. The result would be that the consumers would get electricity at about the same price as they would obtain gas, with the addition of interest on capital laid out in dynamo and mains, and the wages of the men in charge." The station would have to be in somebody's garden, and the mains would need to be taken along the backs, to avoid interfering with the roadway. No Provisional Order would then be needed; and it is stated by our sanguine contemporary that "if the gas company were to become responsible for the engines, there would be persons ready enough to take the responsibility of supplying dynamos and keeping the plant running." Not to appear churlish in face of such a brilliant opening for keeping up the demand for gas, we venture to observe that if such a neighbourhood as is here imagined can be discovered by one of those wandering electricians who are understood to be going up and down upon the earth, and walking to and fro in it, in search of a job, and the twelve or fourteen owners or occupiers of the twelve or fourteen eligible family residences that enter into the problem can be brought into one mind on the subject, with fair prospect of continuing therein, the local gas company will probably not be backward in doing whatever may be necessary in trying so interesting an experiment. We are assured that "such an arrangement might be carried out over and over again in the suburbs of London." When the locality suitable for the first venture of the kind is pitched upon, and the residents duly talked over, including the man who is to have the iron engine-house in his garden, it will be quite time enough to discuss the project further.

RULES OF ASSOCIATIONS OF EMPLOYERS AND EMPLOYED.

An important Blue-book has lately been issued by the Royal Commission on Labour, containing "Rules of Associations of Employers and of Employed," together with introductory memoranda drawn up by the industrious Secretary of the Commission, Mr. Geoffrey Drage, who also gives in an Appendix full details concerning certain typical trade organizations, which, as he says, afford an idea of the volume and complexity of the materials with which he has had to deal in preparing this valuable and instructive compilation of upwards of 500 pages. The existence and working of these associations were brought under the notice of the Commission by many witnesses; and this book is to be taken as formal support of the evidence given on the subject of trade societies. Mr. Drage has received copies of rules from 377 workmen's associations, which he has classified roughly into three divisions, according as they (1) act chiefly as friendly societies in providing benefit funds for their members, (2) are mainly concerned with taking action in trade disputes, and (3) combine the functions of friendly and protective associations. In many cases it is noticed that societies which are classified as mainly for the protection of trade, put forward in addition other objects of a more general nature.

In many cases, the actual rules of the society are preceded by a preface or preamble, which states the objects of the society and the means by which it is hoped to carry them out. A great number of associations mention the regulation of wages among their objects; this being usually expressed euphemistically in the power of a desire "to maintain a fair rate of wages," or "to secure the highest possible remuneration for labour." In some instances, more definite statements are made with regard to the particular reforms to be carried out, and rights to be maintained. Thus, the Gas Workers and General Labourers' Union aims at obtaining "for the same work the same wages for women as men." The regulation of the hours of labour is also a very general object of the Unions. The Gas Workers are committed to obtain an eight-hour day wherever possible; while the General Labourers' Amalgamated Union wishes "to diminish the hours of labour to such an extent as is consistent with men's moral and physical nature." Some societies want to abolish piecework; others desire better regulations, with a view to safe working, and the control of insalubrious trades; and the Gas Workers' Union would "abolish the present system of contracts and agreements between employers and employed."

Many societies express a wish to regulate the general relations between workmen and their employers, or between fellow-workers in the same trade. The majority of Unions engage to support their members in case of "justifiable strikes," or to afford them legal or other assistance in case of injustice or encroachment upon their rights on the part of the employers. The Unions have different ways of expressing themselves on this part of the labour question; the South Side Labour Protection League laying it down as an axiom that, "in any dispute between employer and employed, the position of this League should be that the workmen is bound to be right, and the employer is bound to be wrong." The Gas Workers also declare that "to-day there are only two classes—the producing working class, and the possessing master class. The interests of these two classes are opposed to each other." These Unions are at one end of the line; the other being represented by an Operative Cotton Spinners Association, which is convinced that the sympathy and co-operation of the employers are "essential to its complete success." Political objects are openly avowed by some of the societies; but not to the extent which is actually practised by the Union officials who have identified their organizations with the promotion of the Independent Labour Party, and similar schemes of the kind. Many pages of the Blue-book are devoted to a summary of the methods of government and internal organizations of the Unions; but many more would be required to show how these actually work.

Take, for example, the regulations for dealing with disputes with employers, and with the sanction and control of strikes. Mr. Drage says, in his summary, that, in case of a dispute with an employer, the member or members concerned are "generally" required to lay the case at once before the Secretary or other officers of their branch, or, in those societies which have no subdivisions, before the General Secretary or Executive Committee. This reads very fairly; but the interested reader is likely to compare the letter of the regulation with the actual practices of "down tools," and peremptory interference of "jacks-in-office" of branch officials with the course of work, which have precipitated the most serious strikes, and have made the Unions difficult to get on with. Then with regard to strikes, in how many instances have these outbreaks been ordered by the deliberate judgment of the Union executive?

Sometimes, indeed, the independent action of "branches" is explicity allowed, as by the South Side League, which provides that if the Council decides against a strike, the branch affected may go on its own way; and another organization also lays down that, in the event of a strike being entered upon, without the consent of the executive, no members of a federated society may do the work of those on strike. What is the good of an executive in these circumstances does not appear. Several societies, however, deal very severely with members who leave their employment without permission of the executive, whose discretion in this matter is sometimes fettered by regard to the state of the exchequer.

Certain regulations with respect to the behaviour of members towards their employers are contained in the rules of the majority of the societies. These sometimes take the form of forbidding the members to boast of their independence towards their employers or foremen, on account of their membership of the society; and a fine or other penalty is imposed upon members who break this rule. Abusive, threatening, or insulting language towards employers is also forbidden by the rules of several associations; and a few direct that meetings to discuss grievances, &c., shall not be held on the employer's premises, nor in his time. It is right also to record that many societies expressly forbid any breach of contract or act of dishonesty on the part of their members towards an employer; and several visit such offences with a more or less severe punishment. With regard to the attitude of members towards non-unionists, it would be unnatural for this to be otherwise than hostile; and the fact is expressed in a variety of ways, sometimes verging on the ludicious. It is generally laid down that a member who obtains, or endeavours to obtain, work for a non-society man while any suitable member is unemployed, subjects himself to a fine, expulsion, or other penalty. In many societies also members are either entirely forbidden to work with non-unionists, or are only allowed to do so in case of necessity or if no members are eligible for the work. In some associations, the members are forbidden to teach their trade to non-unionists, or to help them in their work, or lend them tools. The duty of persuading non-members to join the society is frequently urged upon members; and in some societies they are fined if they do not use "all lawful means" to induce non-members to join. One Union, however—the Amalgamated Carters'—is distinguished by forbidding its members to "use intimidating language, or be troublesomely solicitous towards any man to join this society. All requests to join must be made in a reasonable and friendly manner, outside the employers' premises and out of work hours." This exceptional Union has its head-quarters in Glasgow. Its preamble adds that the claims of the society will be "based on justice and enforced with moderation; and, further, that it looks forward to a time when some more general principles of co-operation shall be acknowledged in society, guaranteeing to every man the full enjoyment of the produce of his labour." It would be interesting to know how this Union fares.

There are also in the Blue-book lengthy memoranda on the rules of Employers' Associations, Trade Councils, Chambers of Commerce, and Boards of Arbitration and Conciliation. Some of the seventy associations of employers whose rules have been received by the Commission appear to be intended, either entirely or partially, to regulate the relations between employers and their workmen, and to control rates of wages and other conditions of employment, as well as to support members in their disputes with workpeople. Other associations appear to aim rather at providing the benefits of insurance and trade protection for their members, without any special reference to their relations with their workpeople; while others again afford their members benefits, and declare their objects to be of both kinds. It is difficult, however, to draw any very clear distinction between these various classes of Employers' Associations; and most of them fulfil the double function. The majority of these bodies lay down some regulations for disputes between the members and their workpeople, and several undertake to provide assistance for members whose workpeople are on strike, if the strike arises out of a matter of principle, or in consequence of action taken at the advice of the association. Many of these organizations are of a district or local character, and provide for the formation of a wages board, sliding scale, or other means of securing uniformity of the conditions of employment in the district. The rules of Trades Councils and Chambers of Commerce need not be discussed here. Mr. Drage's observations on the subject of Boards of Arbitration and Conciliation are worth perusal, as they are both historical and critical. They show how much has been effected in the direction of referring industrial disputes to arbitration; but the lack of means to enforce either references or awards is admittedly a bar to the extension, and a block upon the efficiency of this excellent system.

To return to the associations of workmen, which are by far the most interesting as well as the bulkiest of the matters dealt with by Mr. Drage, he gives hundreds of pages of abstracts of rules and regulations of Trades Unions, new and old, from which, as from the appendix containing the complete rules of typical societies, all information that can be desired respecting the mutual organization of labour is to be obtained. The first thing that strikes an examiner of these well-filled pages is utter amazement at the great activity in the organization of labour that has marked the past four or five years; and the next impression to be received is respect for the intelligence and practical wisdom which marks much of the work done in this regard. There must have been a perfect factory of Trades Unions in full blast for years, the managers of which must have done very good business in discriminating between the various "trades" and starting the Unions in a fair way of working. Unfortunately, there are no reliable means of ascertaining the ages of the different Unions; their chronology being determinable in most instances only from the printing or adoption of the code of rules actually in force. As a general thing, however, it may be assumed that the associations of skilled handicraftsmen are the oldest Unions, and also that these offer the most complete scale of benefits to their members, and are the most highly organized. Examples of every grade of Trade Union are included in this collection, from the Boiler Makers' down to the Dockers'—that is to say, from the tradesmen's guild to the inchoate association which is more a name and a rallying-point for socialistic agitators than anything else.

There is all the difference in the world, in point of fact, and only the similarity of name, between the two Unions above named. This appears from the respective prefaces to the general rules. The Boiler Makers say that their society is instituted "for the support of its members when thrown out of employment, the relief of their sick, the maintenance of their aged members, the burial of their dead, and for other benevolent purposes." Yet it is not a benefit society, such as are composed of members drawn from the community at large, but seeks to copy all that is good in these, and apply it to trade as well as personal emergencies. It is argued that union will be productive of high moral results, will deepen respect for law and order, and will encourage the principle of good will and brotherly love. The Operative Cotton Spinners—a Union of the same order—go a little farther. They state that their association is formed "to secure to all its members the fair reward of their labour, to provide for the settlement in a conciliatory manner of disputes between employers and employed, so that a cessation of work may be avoided," and for other similar purposes. What a long step there is from these temperate declarations to the socialistic rhetoric of the preamble to the rules of the "Dock, Wharf, Riverside, and General Labourers' Union of Great Britain and Ireland," which starts thus: "Poverty is the curse of mankind; poverty is the parent of vice, theft, roguery, rascality, and consequent misery; poverty drives honest-hearted, earnest men and women to a pauper's grave," &c.; and then goes on to assert that "to mitigate, aye, to abolish this thrice-accursed poverty is the work of Trades Unionism." It is hardly necessary to remark that, according to the rules, this is intended to be a "fighting Union," and nothing else. Or take the "address" that prefaces the rules of the Gas Workers' Union, the most notable passage of which—the declaration of the fundamental opposition of the interests of the "two classes" of employers and employed—has already been remarked upon. This composition is the production of perhaps the crudest thinkers that ever attempted to discuss, by their own lights, the problems of labour and wages. Is it wonderful that a society carrying so many blunders in its principles should have gone wrong in practice? No more was to have been expected of an organization founded and controlled by men who were incapable of seeing that the apparent antagonism of employers and employed is part and parcel of a greater unity—the interest of industry as a whole; just as the equally obvious antagonism of buyer and seller is merged in the essential union of commerce. The South Side Labour League, which probably drags out an existence mainly in order that the secretary and other officials shall get their salaries, is another of these socialistic creations; and any Surrey-side "lumper" who is able to respect himself must feel threepence a week a cheap price to pay for the assurance that whenever he has a fall out with his employer he is bound to be in the right, as the latter is bound to be in the wrong. There would be more comfort in this statement, however, if the League were more efficient in ensuring that what it officially regards as the right side in any possible dispute should always win.

Very precise is the knowledge of economic data pretended to by the Ayrshire Miners' Union and Guild of Comrade Colliers—a society established in 1886, and consequently of respectable antiquity, as new Unions go. A whole article—even a volume—might be written upon the text of the preamble to the rules of this society, which is one of those organizations deemed by Mr. Drage worthy to have its constitution reported at length. This important document is headed with the quotation: "The Labourer is worthy of his Hire," which is textually accurate. It is, however, followed by another: "He who will not work neither *should* he eat"—in which the italicized word is a weak substitution for the imperative "shall" of the Authorized Version. Then we are treated to axiomatic remarks about the source of all wealth being labour, &c., as to which it must be enough for the present to observe that the Scottish framer of these generalities had better have a talk with His Grace of Argyll. Altogether, while felicitating Mr. Drage upon the result of his editorial labours, we feel it a duty to recommend employers of labour—and not only employers, but all who are interested in industrial subjects—to procure a copy of this really indispensable Blue-book.

TECHNICAL RECORD.

THE HEAT OF COMBUSTION OF THE PRINCIPAL GASEOUS HYDROCARBONS.

In a recent number of the *Comptes Rendus*, there appeared a paper on the above subject by MM. Berthelot and Matignon. The following is an abstract translation thereof, in so far as it is of interest to the gas community.

Messrs. Dulong, Andrews, Favre and Silbermann, and Berthelot and Thomsen, have made many determinations of the heat of combustion of gaseous hydrocarbons, with tolerably concordant results, but in some instances differing by at least 1 per cent. The differences may be accounted for partly by the varying degree of purity of the gas, and partly by the experimental methods adopted. The use of compressed oxygen in the calorimetric bomb adds considerable precision to the latter. It therefore appeared desirable to repeat the determinations; and the figures now obtained are doubtless more exact than the earlier ones.

The method of procedure is minutely described in the "Traité pratique de Calorimétrie chimique," recently published. Briefly, the bomb is exhausted two or three times—the combustible gas being introduced after each exhaustion; so that when it is filled for the last time it is free from air, and contains a definite volume of gas at known temperature and pressure. Oxygen, under compression, is then forced into the bomb in more than the theoretical quantity for the complete combustion of the gas. The bomb is then put into the calorimeter, the gases fired, and the heat generated measured. The results are checked by passing the products of combustion through carbonic acid absorption-tubes, whereby the amount of carbonic acid produced is ascertained. For this purpose, the gases are withdrawn from the bomb by alternately exhausting it and refilling with air free from carbonic acid; the pressure inside being kept below that of the atmosphere, to prevent possible loss of carbonic acid at the joints. The weight of carbonic acid should agree exactly with the volume of gas taken; thereby affording a perfect check on the accuracy of the observation. For industrial purposes, more rapid and sufficiently exact determinations may be made by using a bomb with a double tubulure, which enables the filling to be done by merely passing a current of the gas through the bomb. The tedious weighing of the carbonic acid produced may also be omitted. Thus carried out, the method is most expeditious, and gives the calorimetric value of the gas in a few minutes; but it is not sufficiently exact for the purposes of scientific research.

The following gases have been experimented upon in the present instance: Hydrogen, carbonic oxide, ethylene, ethane, propane, allylene, propylene, and its isomer trimethylene. It was deemed unnecessary to repeat the determinations made on methane and acetylene with the calorimetric bomb in 1880. The following are the results obtained:—

Hydrogen ($H_2 = 2$; $H_2 + O = H_2O$, liquid).—Four determinations were made at 10° C.; giving a mean of 68·00 calories at constant volume. The two most reliable experiments gave 67·90 and 68·20 calories, or a mean of 68·15 calories, which is the figure that should be adopted. Reduced to constant pressure, this becomes 68·99 calories—practically 69 calories, which had been previously adopted.

Carbonic Oxide ($CO = 28$; $CO + O = CO_2$).—Three determinations at 12° C. gave 68·6, 67·5, and 67·6 calories—a mean of 67·9 calories at constant volume, or 68·2 calories at constant pressure. Previous determinations gave 68·18 calories by ordinary combustion, and 68·28 calories by explosion—a mean of 68·23 calories. The heat of formation from the elements, C (diamond) + O, is + 26·1 calories. According to MM. Berthelot and Petit, the heat of combustion of carbon to carbonic acid C (diamond) + $O_2 = CO_2$ is + 94·3 calories; from which, and the heat of combustion of carbonic oxide, the heat of formation of the latter here given is deduced.

Methane.—The determination (made 1881) giving 213·5 calories at constant pressure, is adhered to. The heat of formation from the elements, C (diamond) + H_4 is + 18·7 calories.

Acetylene ($C_2H_2 = 26$).—The figure preferred is one formerly obtained with the bomb—315·7 calories at constant pressure. The heat of formation from the elements, C_2 (diamond) + H_2 is + 58·1 calories.

Ethylene ($C_2H_4 = 28$).—Three combustions were made at about 12° C. Calculated from the volume of gas, the figures are 339·5, 341·1, and 339 calories—a mean of 339·9 calories at constant volume. From the weight of carbonic acid, they are 341·5, 339·7, and 339·4 calories—a mean of 340·2 calories at constant volume. The general mean is 340·05 calories at constant volume, and 341·1 calories at constant pressure. With the bomb in 1881, M. Berthelot obtained 341·4 calories, which is in complete accord with the present determination. The heat of formation from the elements, $C_2 + H_4$, is − 14·6 calories.

Ethane ($C_2H_6 = 30$).—The gas was prepared by electrolysis; and three combustions were made—the calculations being from the weight of carbonic acid. The results were 371·5, 370·6, 370·5 calories—a mean of 370·9 calories at constant volume, or 372·3 calories at constant pressure. This figure should be substituted for that hitherto adopted, which was too high. The heat of formation from the elements, $C_2 + H_6$ is 23·3 calories.

Propane ($C_3H_8 = 44$).—This was prepared from isopropyliodide, with zinc and dilute hydrochloric acid; but it was not free from hydrogen, of which it contained about one-fifth its volume. Allowance was made for this in three combustions at about 17° C. The figures deduced from the weight of carbonic acid were: 527·3, 525·1, and 527·8 calories—a mean of 526·7 calories at constant volume, or 528·4 calories at constant pressure. The heat of formation from the elements is + 30·5 calories.

Allylene ($C_3H_4 = 40$).—Three combustions at about 16° C. gave 469·7, 474·5, and 472·9 calories—a mean of 472·4 calories at constant volume, or 473·6 calories at constant pressure. This body is difficult of purification. The heat of formation from the elements, $C_3 + H_4$ is − 52·6 calories.

Propylene ($C_3H_6 = 42$).—This was prepared from allyliodide; and three combustions were made at about 15° C. They gave from the volume of the gas, 498·2, 497·5, and 497·5 calories—a mean of 497·7 calories at constant volume. The first and third combustions gave from the weight of carbonic acid, 498·3 and 498 calories—a mean of 498·15 calories at constant volume. This was a general mean of 497·9 calories at constant volume, or 499·3 calories at constant pressure. The heat of formation from the elements is − 9·4 calories.

Trimethylene ($C_3H_6 = 42$).—Three combustions were made at about 16° C.; the last being with a different sample of the gas. The results, calculated from the volume of the gas, were: 508·1, 509·5, and 509·0 calories—a mean of 508·9 calories at constant volume. From the weight of carbonic acid, they were 505·3, 504·9, and 506·6 calories—a mean of 505·6 calories at constant volume. The near approximation of these two results shows that the density of trimethylene is in accordance with the molecular formula, C_3H_6. It is perhaps preferable to adopt the number deduced from the weight of carbonic acid—*i.e.*, 505·6 calories at constant volume, or 507 calories at constant pressure. The heat of formation from the elements is − 17·1 calories.

It may be useful to point out certain agreements among the numbers obtained. Thus, comparing those for homologous bodies—

		Heat of Combustion.		Heat of Formation.	
Methane	(CH_4)	213·5	158·8	+ 18·7	+ 4·6
Ethane	(C_2H_6)	372·3		+ 23·3	
Propane	(C_3H_8)	528·4	156·1	+ 30·5	+ 7·2
Ethylene	(C_2H_4)	341·2	158·1	− 14·6	+ 5·2
Propylene	(C_3H_6)	499·3		− 9·4	
Trimethylene	(C_3H_6)	507·0		− 17·1	
Acetylene	(C_2H_2)	315·5	158·1	− 58·1	+ 5·5
Allylene	(C_3H_4)	474·6		− 52·6	

It will be seen that the difference of the heat of combustion of homologous hydrocarbons is virtually constant, and about 157, which, as M. Berthelot showed in 1865, represents the mean difference between homologous bodies. Subsequent observers have confirmed this number. The correlative difference between the heats of formation is similarly nearly constant at about 5·5. The following formulæ, applicable to gaseous hydrocarbons of similar constitution, may therefore be adopted:—

		Heat of Combustion.	Heat of Formation.
Methane series	$C_{n+1}H_{2(n+1)+2}$	$213·5 + 157·5^n$	$+18·7 + 5·5^n$
Olefine series	$C_{n+2}H_{2(n+2)}$	$341·2 + 157·5^n$	$-14·6 + 5·5^n$
Acetylene series	$C_{n+2}H_{2^n}$	$315·5 + 157·5^n$	$-58·1 + 5·5^n$

Next take the alteration in hydrogenation of a hydrocarbon—*i.e.*, its diminution in capacity of saturation, or in free bonds—

First stage.	$C_2H_2 + H_2 = C_2H_4$	+ 43·5 calories.
	$C_3H_4 + H_2 = C_3H_6$	+ 43·2 ,,
Second stage.	$C_2H_4 + H_2 = C_2H_6$	+ 37·9 ,,
	$C_3H_6 + H_2 = C_3H_8$	+ 39·9 ,,

These figures show very regular relations, and that the second hydrogenation disengages less heat than the first. Data do not suffice for further generalizations in this direction.

The remainder of the paper is devoted to a consideration of the synthetic formula of trimethylene; and, though of great value as a contribution to theoretical chemistry, it is not of sufficient general interest to justify reproduction in the JOURNAL.

The Supply of Water for Fire Extinction.—On the morning of Tuesday last a fire broke out in St. Mary Axe, London, which taxed to the utmost the resources of the Fire Brigade. No less than 38 fire-engines and 12 hydrants were at work, pouring vast volumes of water upon the burning buildings. This was, of course, drawn from the mains of the New River Company; and it is satisfactory to learn that an abundant supply at good pressure was kept up. Between the outbreak on the morning of the 18th and the evening of the following day, about 4,500,000 gallons (equal to about 20,000 tons) of water were delivered; and some of the hydrants were kept at work for several days. Notwithstanding this excessive draught in a particular locality, the ordinary service of the surrounding districts did not suffer in efficiency. It may be added (as this fact is far too frequently ignored) that no payment is made to the Company for water used for the extinction of fires.

AUSTRO-HUNGARIAN GAS ASSOCIATION.

At the Annual Meeting of the above Association, which took place at Pressburg on the 12th and 13th of May, several interesting papers were read.

A communication was received from Herr Zubr, of Vienna, on his system of heating retort-benches. This does not rely upon regeneration, but aims at effecting economy of fuel by varying the quantity of air admitted. For this purpose, the amount of primary air, which is admitted under the fire-bars, as well as that of the secondary air, which enters through an opening in the upper fire-door, and therefore passes over the fuel, is regulated by simple means. When the fire is made up, the full quantity of air is admitted; but as soon as the coke is partly burnt through, the inflow is checked, and when the coke is in a state of thorough incandescence, the supply of air is reduced to the minimum, which causes slower combustion. These arrangements are said to be applicable to all kinds of retort-settings; and while they effect a considerable saving in the fuel account, working out to about 13 per cent. of the coal carbonized, they do not demand a larger outlay of capital than the most simple form of furnace.

A paper was read by Herr Keller, embodying the results of a long series of careful observations of Peischer's self-filling gas-meter, which had, for comparison, been connected with an ordinary wet meter. The result of the experiments, which lasted for 70 days, was to show that the self-filling meter registered 8·18 per cent. more than the ordinary one. During this period the level of the water in the former remained constant; whereas the latter was refilled three times. Herr Keller stated that the extra cost of introducing these compensating meters would be recovered in one year.

On the subject of "The Advantages of Gas compared with other Fuels," a paper was read by Herr Schweickhart, which dealt to a great extent with the theoretical aspects of the question; more especially comparing the effect and cost of gas employed for cooking purposes with oil and spirit burners. He further pointed out the necessity for popularizing the use of gas for culinary operations; mentioning the prejudices which still exist against this mode of preparing food for the table, and stating that lectures given by ladies, where the visitors were invited to assure themselves of the excellent results of the cooking, seemed to be the best means of proving that prejudices against gaseous fuel are unfounded. Herr Schweickhart also demonstrated a new Bunsen burner for safely heating inflammable fluids; the flame being protected by wire gauze.

Herr E. Körting lectured on the subject of inclined retorts; describing, with the aid of large drawings, the plant which has been erected at the Erdberg station of the Imperial Continental Gas Association in Vienna, and which is said to give thoroughly satisfactory results.

At the close of the business, the members dined together; and they afterwards inspected the new water-works and the lighting arrangements of the theatre.

A Large Wire Rope.—One of the largest steel wire cables on record has just been made by Messrs. W. B. Brown and Co., of Bankhall, Liverpool. It has a continuous length of 4½ miles, or one mile longer than a similar cable which they manufactured a few months ago. The total weight is upwards of 25 tons. It is 3¾ inches in circumference, and is made upon Lang's principle, with 42 wires of No. 10 standard wire gauge of the finest quality of crucible steel wire; the tensile strength of the cable exceeding 45 tons. The cable is to be used for endless haulage, and for transmitting loads of 40 to 60 tons at a speed of 8 miles an hour.

Micro-Organisms in Water.—We learn that a work specially devoted to the above subject is about to be issued by Professor and Mrs. Percy Frankland. It will deal not only with the presence and significance of bacteria in water, but also with the various means of effecting their removal, and an account will be given of what is known concerning the vitality of pathogenic microbes in various waters. A tabulated description of the microscopic and mascroscopic characters of all the micro-organisms, both pathogenic and non-pathogenic, hitherto discovered in water will be appended; while a special part will be devoted to the methods involved in the bacteriological examination of water. The work is intended to serve as a handbook for all interested in the sanitary aspects of water supply.

Death of Mr. John Head.—We regret to announce the death of Mr. John Head, of 10, Queen Anne's Gate, Westminster, which took place on the 14th inst., after a short illness. Mr. Head was first employed by Messrs. Siemens and Halske in London, under the late Sir William Siemens, whose personal assistant he became in the year 1860; and he was also an assistant in the firm of Messrs. Siemens Bros. He was afterwards Sir William Siemens's principal assistant until the time of his death. From that date Mr. Head managed the civil engineering business, in London, of Mr. Frederick Siemens. Deceased was a member of several scientific societies—among others, the Institution of Civil Engineers, Geological Society, and Iron and Steel Institute; and he was the author of papers on regenerative gas furnaces and on metallurgical subjects brought before the latter and kindred associations.

BELGIAN ASSOCIATION OF GAS MANAGERS.

The Annual Meeting of this Association was held at Liége on the 28th and 29th ult., under the presidency of M. Boscheron; and it was attended by the Managers of the principal gas-works in Belgium. The following condensed report of the proceedings has been supplied by an esteemed correspondent in Brussels who was present.

The proceedings on the first day were opened by the President, who explained the financial position of the Association. Following this came an address upon the present and future position of gas, which, notwithstanding all that may be said, contends successfully against its rivals—both electricity and petroleum. Electricity, it was pointed out, is only in a progressive state; but petroleum, which is now sold at 10c. per litre, is becoming a very troublesome neighbour. The President therefore counselled vigilance on the part of his hearers. He then passed on to refer to various heating agents, among others coke, which can now be used in a rational manner, and to which attention should be directed more regularly, with the view to ensuring for it a favourable market. The remarks of the President were cordially received.

The next business was the election of members and officers. Seven new members were admitted, among them being Mr. Kirkpatrick, of the Solvay Association. M. Boscheron having completed his term of office, a ballot was taken for the appointment of a successor and other office-bearers. MM. De Brouwer, Weiskirchen, and Willems were elected members of the Committee; M. Busine, Manager of the Mons Valley Lighting Company, was appointed President for two years, and M. Weiskirchen, Managing Director of the Central Gas-Works, Vice-President.

After an interval, the technical business was proceeded with. The first communication was by M. Audouin, who presented a very interesting one, supported by numerous experiments undertaken by himself and M. Gérôme, on the relative values of coal and coke as heating agents for industrial purposes. He drew attention to the important future of heating by coke, which has already become, in the hands of experts, a valuable product, the advantages of which do not appear to have been sufficiently appreciated hitherto. The author gave an account of some trials carried on with a steam-boiler; and the figures he produced were very suggestive. The results he obtained were compared with the figures in the official reports made by the Belgian State engineers; and they appeared to absolutely concur in demonstrating the great intrinsic value of coke. The work, as the President remarked, reflected very great credit on those who undertook it.

M. Bandsept followed with some observations on the production and rational employment of the intense heat of gas, in the course of which he described the process with which he has experimented, and to which reference has been already made in the JOURNAL.* The process consists in mixing, prior to use, the gas and air in the proportions theoretically required for the combustion to be rapid and complete; thus avoiding the production of smoke. He said that one of the essential conditions of perfect combustion is that the combustible should approach as closely as possible, in its physical properties, to the state of the gas with which it is to unite. The combustible must be gasified, instead of being treated as in the systems in which coal dust or pulverized liquids are employed. M. Bandsept explained how the mechanical trituration of the gas and air produces a sort of fixed dissolvent, and how it is used without danger. Exceedingly high and regular temperatures may thus be readily obtained and manipulated with facility. The results are in proportion to the height of the temperature. The figures arrived at after experiments were given. M. Bandsept's remarks excited considerable curiosity.

The next matter was a paper, read by M. Greyson de Schodt, on the ventilation and warming of rooms. It was a compilation of the principles governing this important question, which the author treated in all its details; embracing the general conditions to be observed whenever a system of hygienic warming and ventilating is to be applied. He passed in review all the essential conditions of a good make of apparatus, and indicated the particular features which must be borne in mind according to each case, and with regard to the calorific agent to which preference may be given. He criticized certain defective arrangements which are still in vogue, and formulated some general rules to be followed, which may assist in finding a rational solution in many cases. In short, M. Greyson collected and compiled all that appeared to him to bear on the difficult problem of perfect warming and ventilation.

After an exchange of views on the subjects dealt with, in the course of which an eminent member of the Association reminded his colleagues of the good results obtained in Brussels at the competition of heating appliances, which would henceforth furnish indications as to the choice of such apparatus, the business of the meeting closed.

The members then proceeded to visit the gas-works in the Rue des Bayards, where M. Boscheron, who has recently been promoted to the post of Chief Gas Engineer of Liége, conducted the party, and pointed out the principal improvements carried

* See Vol. LXI., p. 827.

out within the last few years. There is in course of construction at the works a new holder, capable of containing 10,000 cubic metres of gas, at the side of the present 15,000 cubic metre holder. A new system of ovens attracted attention; also a very fine condenser, an equally fine purifier, and apparatus for treating the ammoniacal liquor. At the other end of the Rue des Bayards are the workshops of the Société Internationale d'Electricité, which are under the direction of M. Pieper and his son. Here the members satisfied themselves that their rivals in lighting are also making great progress in many other industrial applications; for, besides lighting apparatus, which they make in very large quantities, MM. Pieper construct dynamos for transmitting power; and nearly all their machines are worked by electricity. The visitors were conducted round by the engineers of the firm.

The following day, a visit was paid to the Herstal Small Arms Factory, all the wonders of which it would take too long even to attempt to describe. Here, too, everything is done by electricity—machine and tool working, power transmission, as well as lighting. The morning passed quickly in the examination of all the interesting things presented to the visitors, some of whom arranged to meet there again to complete the particulars which had been supplied to them during the short time at their disposal. Other establishments were subsequently visited; and the members then dispersed.

The Gaslight and Coke Company.—At the forthcoming half-yearly meeting of this Company, the Directors will recommend a dividend at the rate of 12 per cent. per annum for the six months ending June 30 last; carrying forward £21,082.

Death of Mr. W. T. Evans, of Cardiff.—The death is announced (as having taken place on the 8th inst.) of Mr. W. T. Evans, Manager of the Grangetown Gas-Works of the Cardiff Gas Company. As already stated, Mr. G. F. Brown, late of Birmingham, has been appointed to the managership.

Death of Mr. John M'Gillewie, of Perth.—Mr. John M'Gillewie, Treasurer to the Perth Gas Commission, died in Perth on Sunday, the 16th inst., after having been in indifferent health for about six months. He was in the employment of the Perth Gas Company at the time the Corporation took over their undertaking, in 1871, when he was appointed Treasurer to the Commission—a post which he held till his death.

Mr. John Mackay.—We learn that Mr. John Mackay, of Peterhead, whose resignation of the post of Manager of the gas-works in that town was mentioned by our Scotch Correspondent last week, has accepted an appointment in the firm of Messrs. Alder and Mackay, meter makers, of Edinburgh. Mr. Mackay, it will be remembered, has given considerable attention to the subject of enriching coal gas with oil gas; and the discussion of his paper on the subject, read at the meeting of the North British Association of Gas Managers last year, is expected to form an important item in the proceedings at the meeting of the Association next Thursday.

The Gas, Water, and Electric Lighting Companies' Directory, &c.—We have received from the publishers (Messrs. Hazell, Watson, and Viney, Limited) a copy of the above work for the present year. This is the seventeenth issue of the book, and it contains several new features; the principal one being a review of the leading general and technical events which have occurred in the gas, water, and electric lighting industries since the last edition of the Directory was published. A list is also given of the Associations of Gas Managers in the United Kingdom. Some changes have been effected in the arrangement of the matter to facilitate reference; and it need scarcely be said that every care has been taken to make the statistics presented as accurate and up to date as possible.

Incorporated Association of Municipal and County Engineers.—The annual meeting of this Association was held at West Bromwich from the 13th to the 15th inst. The report of the Council, which was read by the Secretary (Mr. T. Cole, Assoc.M.Inst.C.E.), expressed their gratification at the continued success of the Association, which during the twelve months ending April 30 last had increased its numbers by 37 ordinary members and 13 graduates. At the close of the year, there were on the roll of the Association 11 honorary members, 485 ordinary members, and 47 graduates; being an addition of 40 to the membership, as compared with the previous year. The balance in hand was £110, in addition to £300 invested. The report stated that Mr. J. T. Eayrs, of West Bromwich, had been elected President; the Vice-Presidents being Mr. A. R. Binnie, of London, Mr. J. Cooper, of Edinburgh, and Mr. S. Harty, of Dublin. The first premium (£10) for papers was awarded to Mr. J. H. Cox, of Bradford, for his paper on "Street Tramways and Electrical Traction," read at the Bury meeting; the second (£5), to Mr. S. Harty, for his paper on "Sanitary and other Works carried out by the Corporation of Dublin," read at the meeting in that city. These premiums were presented in the form of books. The President's address consisted of a review of the circumstances affecting the position of municipal engineers individually and as a body. At its close, the members were entertained at luncheon by the Mayor (Mr. C. Akrill). On the resumption of the proceedings in the afternoon, the technical business was proceeded with. The nature of this has been already indicated in the JOURNAL; and further reference to it must be reserved.

PHOTOMETRY AT THE PHYSICAL SOCIETY.

In the JOURNAL for the 20th ult., there was a brief notice of some communications recently made to the Physical Society by Mr. A. P. TROTTER and Professor S. P. THOMPSON on the subject of photometry. We are now in a position to deal with the matter at greater length.

Mr. Trotter described his new photometer, which is a modification of the illumination photometer, which has already been referred to in our columns (see Vol. LIX., p. 1005), so as to adapt it to the measurement of candle power. As previously explained, the principle employed is to view a screen illuminated by one source of light through an aperture in a second screen illuminated by the other light; the aperture becoming invisible when the illuminations are equal. After using perforations of various patterns, a series of narrow slits cut in thin paper were found to give the best result. The plain screen is mounted behind the slotted one, in a box sliding on the photometer bench; and they are arranged so that the light falls on them at equal angles. The screens are viewed from a distance of 6 or 7 feet through an opening in the front of the box; cords being provided for producing the traversing motion. Two sights—set respectively at the middle of the length of the plain screen, and on the lower edge of the front opening—serve to show when the middle of the band of equal illumination is vertically above the pointer on the carriage. The photometer is found to be particularly valuable when it is desired to determine the maximum power of a variable source. When lights of different colour are being compared—say, a gas-flame and an arc lamp—one end of the screen shows blue strips on a yellow ground, and the other end yellow strips on a blue ground; at the centre, the colours seem to blend. To facilitate the comparison of such lights, Mr. Crompton, who has been working at the subject simultaneously with the author, uses one screen tinted pale yellow, and the other pale blue. Details of construction of the new photometer were given in the paper; and the accuracy attainable, when comparing two equal lights of (say) 8 candles, was stated to be about 1 per cent.

Professor Thompson read some notes on photometry. The first related to the use of two overlapping screens as an isophotal; and it described the evolution of the Thompson-Starling photometer. In this instrument a prismatic block, with apex upwards, rests crosswise on the photometer-bench; and the inclined sides are respectively illuminated by the two sources to be compared. In testing different coloured lights, coloured stuffs were placed over the surfaces of the wedge. In some cases notched and overlapping cards were used to form the overlapping surfaces; an inclination of about 70° between the two surfaces being found convenient. The second note referred to the periodic principle in photometry; and in it the author discussed the various methods which have been, or may be, used for producing small differences of decreasing amount between the two sides of a screen. By employing a device of this kind, much greater accuracy of adjustment is possible. In one form of vibration photometer worked out by the author, the paraffin blocks of a Jolly's photometer are mounted at one end of a spring; the other end being fixed to the carriage. The act of moving the carriage starts the blocks vibrating; thus producing the desired variations. In a third note, the question of using the electric arc as a standard of light was dealt with. Since 1878 the positive crater has been used as a standard of whiteness; and last year both the author and Mr. Swinburne suggested that a given area of crater might be employed. This proposal has been carried out by M. Blondel. Since the intrinsic brilliancy of the crater is high, it necessitates very small apertures, or else the use of standards of high candle power. The advantage of using powerful standards was pointed out in the paper. With a circular hole 1 millimetre in diameter, a standard of about 55 candles could be obtained; with such a source, benches longer than usual would be preferable. At the end of the note, the errors which may be introduced by using as an arc standard a hole in a plate of sensible thickness, when viewed obliquely, were investigated, as well as those which are due to inaccuracy of setting the plane of a hole made in foil, perpendicular to the photometer-bench.

In the discussion which followed the reading of the papers, Major-General Festing remarked that reflection from the sides of the hole in a thick plate would tend to lessen the error calculated by Professor Thompson. The ordinary impurities in carbon were not likely to alter the brilliancy of the crater. Captain Abney and himself had no reason to distrust its constancy. Both the vibrating photometer and Mr. Trotter's arrangement would be very useful. Dr. Sumpner said his photometric experience had been obtained with the Bunsen, Jolly, and Lummer-Brodhun types. With the two former, the inaccuracy arising from uncertainty of adjustment was about 0·5 per cent. Changes of about 0·4 per cent. (average) resulted from reversing the screens. The Lummer-Brodhun instrument (which he described) was better than either of the other two; the average error being about 0·25 per cent. Mr. F. Wright thought scientific men gave too little attention to the question of light standards. Photometers could, he said, be relied on much more than any standard at present in use. The Methven screen was the most practical standard yet devised; but, in his opinion, no gaseous flame could be a real standard on account

of the influence of the surrounding atmosphere. Professor Ayrton saw difficulties in using long benches, as suggested by Professor Thompson, on account of the serious atmospheric absorption which occurred with light from arcs. Decreasing the intensity by dispersion or otherwise was preferable. In some tests on glow lamps which were now being carried out, a Bernstein lamp used as a standard was mounted on a spring and vibrated. Mr. Medley exhibited the vibrating standard referred to by Professor Ayrton, and gave a series of numbers showing that with this device, in conjunction with the Lummer-Brodhun photometer, accuracies of about 0·2 per cent. were obtainable. Mr. Swinburne thought Mr. Trotter's arrangement was better than the "wobbling" photometer. With regard to the best length of bench, he was inclined to think the shorter the better, provided its dimensions were large compared with that of the standard light. He concurred with Mr. Wright in his remarks about the desirability of obtaining a better standard. Speaking of the arc as a standard, he said that only impurities less volatile than carbon would influence the brightness. An important factor was the emissivity of the carbon, which might not be constant. Mr. Blakesley thought the accuracy obtainable with Mr. Trotter's photometer had been underrated; and he pointed out that, by using quadrant-shaped screens, intersecting orthogonally on the axis of the photometer, instead of straight ones, the width of the neutral band could be greatly diminished. Mr. Trotter, referring to Professor Thompson's paper, said he had been engaged in collaboration with Mr. Swinburne in developing the arc standard. He had found considerable difficulty in making suitable pinholes. It was no easy matter to accurately measure the hole when made. In photometric measurements, he had found it very important to reverse his screens. Curved screens, as suggested by Mr. Blakesley, had been tried, but with little advantage. They also destroyed the approximate direct-reading property of the photometer. The subject of changing the length of a bench, and its effect on the gradient of illumination, was discussed. With short benches one had to guard against departure from the "inverse square" law, due to the appreciable size of the standard. Recent experiments had shown that light given out by the 1 square millimetre of crater surface differed considerably from 70 candles.

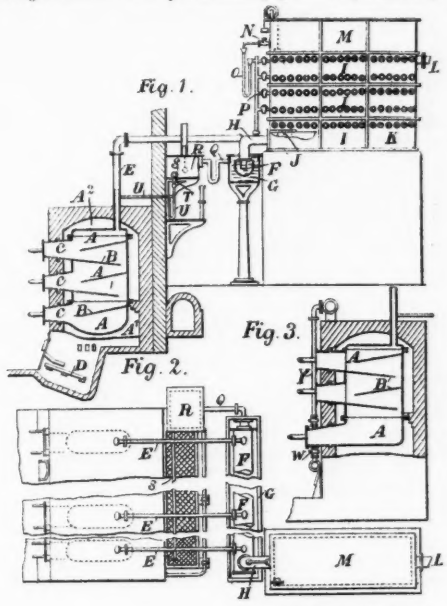
REGISTER OF PATENTS.

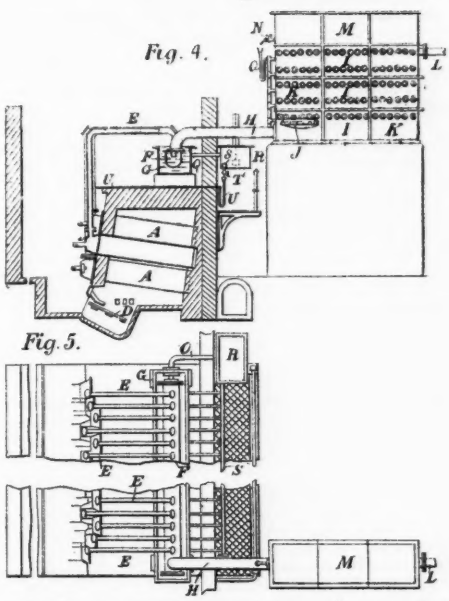
Decomposing Mineral Oils for the Production of Illuminating Gas.—Young, W., and Bell, A., of Peebles, N.B. No. 12,421; July 5, 1892.

In view of the interest being shown in this invention (two papers on the subject are to be read this week before the North British Association of Gas Managers), we give the specification of the patentees practically speaking in their own words: "The invention has for its object to increase the amount of light obtained from a given quantity of mineral oil, when such oil is decomposed by heat in order to produce illuminating gas; and it consists of an improved method of decomposing the oil. Hitherto, when mineral oils have been decomposed for the production of illuminating gas (either alone or in conjunction with some material producing a gas of lower illuminating power—such as coal—or where the oils have been diffused in the form of vapour through water gas), the retorts have been heated to such a temperature that the oil is decomposed at one single operation in a limited period of time; the object being to have the temperature so high as to produce the smallest quantity of liquid or condensable products, and yet sufficiently low not to produce an excessive deposit of sooty carbon. Heretofore considerable difficulty has been experienced in maintaining the proper temperature; and the sooty carbon deposit has proved a great source of inconvenience, whilst the excess of liquid or condensable products has constituted a serious loss. We have discovered that these difficulties can be avoided, and that a much larger illuminating value can be obtained from a given quantity of oil, by subjecting it, either alone or in the presence of a poor gas—such as that obtained from coal or by the decomposition of water—to the repeated and fractional decomposing action of heat of a temperature lower than that which is at present employed in decomposing the oil at one operation, and in such a manner that the heat shall as far as possible act as radiant heat; contact being avoided as much as can be between the oil and oil vapours and the heated surface of the retort, by having the area of the retort large in proportion to its surface. The fractional decomposition of the oil is effected by causing the oil to pass alternately through the decomposing retort and the condenser and washer or scrubber. The oil to be decomposed is employed as the agent to wash or absorb (out of the products coming from the retort) all that are not sufficiently gasified, and convey them back into the retort to undergo further decomposition; the alternate operations of decomposition, condensation, and oil washing being continued till the oil is split up into gaseous compounds and solid carbon."

Figs. 1 and 2 are respectively a vertical section and a plan of an arrangement suitable for the purpose of carrying out of the process, and in which the decomposing vessels or retorts are placed vertically and provided with shelves; fig. 3 being a modification. Figs. 4 and 5 are respectively a vertical section and plan (also partly in section) of a further arrangement, wherein slightly inclined retorts are employed.

In figs. 1 and 2, the retorts A are of round-ended oblong cross section, made of cast iron or steel, and placed vertically. They are provided with shelves B, and openings C, having the usual retort-lids, to enable the coke resulting from the decomposition of the oil to be removed from the retorts. The retorts are shown as being heated by a special furnace, with fire-bars D. But where water gas is being produced to be enriched by oil gas, the producer gas resulting from the blowing of the generator may be employed to heat the retorts to the necessary temperature; or where the process of producing ordinary coal gas is carried on in conjunction with the manufacture of oil gas, the heating of the oil-gas retorts may be effected by the waste heat from the coal-gas retorts. The retorts are preferably heated highest at the lower part. This can be conveniently done by carrying the fire gases along and around the bottom part A^1 first, and subsequently up and around the upper part A^2. The stand-pipes E convey the products resulting from the decomposition of the oil in the retorts to the hydraulic main F, which is kept cool by immersion in water contained in the tank G. The main-pipe H conveys the products (volatile and gaseous) from the hydraulic main to the combined condenser and washer I. This part of the apparatus consists of a rectangular vessel, containing a series of shelves provided with short tubular nozzles covered by light sheet-iron covers, to cause the products passing through it to bubble through, and come into intimate contact with, the fluid contained in the shelves. Part of a shelf is shown at J. In order to cool the products, there are inserted between the shelves the tubes K, passing from side to side of the vessel, so that air can pass freely through them. The permanently gaseous products pass away





by the main-pipe L. On the top of the condenser and washer is placed the tank M (to contain the oil to be decomposed), provided with a float to indicate its contents. The oil is allowed to flow out of the tank, by means of the regulating-valve N, into the filler attached to the tube O. This tube is connected by branch-pipes (provided with stopcocks P) to each of the shelves in the condenser and scrubber, and also to the pipe H leading from the hydraulic main. The oil can thus be made to flow down all or any number of the shelves forming the washing arrangement, or the oil may be allowed to flow direct into the hydraulic main without passing through the washer, according to the amount of washing to which it is desired to subject the gaseous products from the oil. The oil entering the hydraulic main F, at the end from which the decomposed products from the retorts leave, flows through its whole length; and it is then withdrawn at the opposite end by the pipe Q into the cistern R, provided with a float and indicator to show its contents. The oil flows from the cistern by the main-pipe S, provided with valves T, to regulate the flow of oil through the syphon-pipes U into and down the stand-pipes E, on to the upper shelves of the retorts B.

The apparatus is operated in the following manner: The tank M having received a charge of oil, and the retorts being heated to the desired temperature, the regulating-valve N is at first fully opened, and the oil flows through the tube O on to the lower shelf of the condenser and washer, until the bottom part of the condenser and the hydraulic main F are filled up, and the oil has overflowed by the pipe Q and partially filled the compensating-cistern R. The regulating-valve N is then checked, to pass about the quantity it is anticipated the retorts will decompose. The patentees find that 1050° to 1150° Fahr. is a very suitable external temperature to begin with. Different oils, however, require different temperatures; and the effect of externally-applied temperatures can be considerably modified by the rate at which the oil is run into the retort. A large flow of oil lowers the internal temperature of the retort, or keeps the internal temperature at that suitable for the purpose, although the external temperature is raised. Increased external temperature, with proportionally increased flow of oil, leads to a larger product of gases per retort.

The oil is now allowed to flow from the cistern R, through the pipe S, and regulating-valves T, and the syphon-pipes U, into and down the stand-pipes E, on to the first shelf in the retorts. The rate of flow must be largely in excess of that which the heat of the retort will decompose into permanently gaseous compounds. At least one-half the total oil must leave the retort in a condensable form; and with most oils (especially with oils of high gravity) the best results will be obtained when only from one-fourth to one-sixth of the oil passing into the retort is decomposed into permanently gaseous compounds—the three-fourths to five-sixths leaving the retorts as vapour only partially decomposed, or being left in the retort as solid carbon.

The proper quantity of oil to be run into the retort in relation to the externally-applied temperature, is readily ascertained by the appearance of the partially decomposed products, when a portion is allowed to escape by a small stopcock fixed in the retort-door. The products should have the appearance of oil vapour—being whiteish or pale (or at most dark) yellow. When the supply of oil is too small in relation to the temperature of the heat applied to the retort, the vapour becomes more or less dark brown in colour. Such a condition is detrimental to the success of the process.

This large flow of oil, falling upon the first inclined shelf B, runs down it; and thence from shelf to shelf to the bottom of the retort—being exposed in its descending course to the heat radiated from the walls of the retort. As mineral oils consist of a series of hydrocarbons of different boiling points, which the fractional process of decomposing accentuates, on the resulting product getting into circulation, these different grades are volatilized as they in their descent over the shelves in the retort reach their boiling points at distances from the outlet of the retort which increases as the boiling points rise. Thus the vapours into which the oils are successively converted, and each of which is in its turn less easy to decompose, are subjected to correspondingly higher temperatures and longer periods of time. The products resulting from this fractional decomposing treatment of the oil pass up the stand-pipe E, where they are met and partially washed of the grossest matter, by oil admitted by the pipe U and flowing down the stand-pipe to the retort.

The condensation and absorption of most of the oil vapours which have only been partially decomposed on their first exposure to the heat of the retort, takes place whilst bubbling through the oil in the hydraulic main. The great heat resulting from this condensation is rapidly transmitted, through the walls of the hydraulic main, to the surrounding water contained in the cistern.

The more volatile products, together with the gaseous portion, pass by the pipe H from the hydraulic main to the condenser and washer I, where the cooling and washing of the gaseous portion is completed.

For a time, the oil flowing over the lower shelf of the washer is capable of absorbing the vapours out of the gases; but as the process continues, and the apparatus and oils get heated, the oil has to be admitted into the condenser and washer on the higher shelves, so that it may flow down from shelf to shelf and present a greater surface, to more perfectly fractionate out the truly gaseous portion that would otherwise condense. The number of shelves over which it is necessary to pass the oil so as to accomplish this, is dependent upon the nature of the oil employed—oils containing volatile matter having less solvent power than heavy dead oils. The solvent power of the oils diminishes as the temperature rises; and the number of shelves through which the oil is run must be regulated accordingly.

The purpose to which the oil gas is to be applied has also to be taken into consideration, in connection with the washing with oil. When the oil gas is to be used to carburet water gas, or to increase the illuminating power of coal gas, hydrocarbon which would condense out of the oil gas if kept separate, would be rendered perfectly permanent when diffused through these gases; and, therefore, for such a purpose less oil washing is required. Indeed, sufficient washing or scrubbing may for such purposes be obtained by the portion of the oil which escapes decomposition in the retort, but which in a volatilized state passes off with the gases dropping back through the gases rising from the retort. In that case, it is not necessary to pass the crude mineral oil through the washer at all; it being supplied direct to the retorts by a separate pipe connected to the cistern. On the other hand, when the oil gas is to be used for lighting railway carriages, and requires to be stored under considerable pressure, the washing of the oil gases must be more drastic, so as to render the oil gas as free as possible from hydrocarbon, which would condense on compression.

The proper amount of oil washing is readily ascertained by the illuminating power and character of the gas; and the proper quantity of oil flowing into the arrangement from the supply-tank M, through the regulating-valve N, is indicated by the float in the compensating-cistern R. If the supply is in excess of what is being decomposed in the retorts, the indicating-float rises; and it falls when the supply is deficient.

The oil, after having undergone one decomposition in the retort, has had a portion rendered permanently gaseous. This passes away by the pipe L to the purifiers. The remaining partially decomposed portion of the oil, condensed or absorbed by the fresh oil, flows back through the arrangement to the compensating-cistern R, and the commingled oil and partially decomposed products are again submitted to decomposition in the retort, and the resulting products again condensed and washed, as already described. The process of alternate decomposition and condensation and washing is thus continued, with the result that the stream of oil flowing into the apparatus is completely split up into permanently gaseous compounds, which leave the arrangement by the pipe L, and carbon, which is left upon the shelves and bottom of the retort as hard coke.

Fig. 3 shows a modified form of retort, by which—instead of reducing the residue of the oil to coke in the bottom of the retort—it may be decomposed only to such an extent as to allow of its being drawn off by the stopcock W, in a state which on cooling becomes pitch. In working this form, the flow of oil into the retort must be increased, or the temperature of the retort kept a little lower than when coke is produced. The engraving also shows how a poor gas—such as that obtained from the decomposition of water—may be employed; the poor gas being supplied from the main X and branch-pipe Y into the bottom of the retort. By this arrangement, the oils are decomposed in the presence of the poor gas. The patentees believe, however, "that better results are obtained by decomposing the oils and producing the water or other poor gas separately, and commingling them after they are comparatively cold, as a much better fractionation of the products from the oil can be made than when the water gas is present. The water gas is also more easily treated during the process of cooling—enabling water to be freely employed as the cooling agent."

The arrangement shown by figs. 4 and 5 is substantially identical with figs. 1 and 2, and is operated in the same manner; the only essential difference being in the form of the retorts, which are placed at a slight inclination from the horizontal, and contain no shelves. The decomposition of the oil is, however, effected in a similar manner. The oil flows from the stand-pipe on to the bottom of the inclined retort, and down to the opposite end, volatilizing as the temperature rises in the same graded manner as where the oils flow over the shelves in the vertical retort. In thus decomposing the oils in inclined retorts, the patentees do not find it of importance to differentiate the heat applied externally to the retort between the higher and lower end, as the oil entering the higher end rapidly reduces the temperature there to that suitable for the process.

The process may, in part, be carried into effect in many of the existing forms of apparatus, both in which oil gas is produced alone and also in those in which oil gas is produced by decomposing oil in the presence of poor gas from coal, or in the presence of water gas in retorts or in decomposing vessels heated externally. When producing gas from oil by existing arrangements, in accordance with this invention, the temperature at which the oil is decomposed would be reduced by adjusting the inflow of oil to the temperature of the decomposing vessel (the higher the temperature of the decomposing vessel, the larger the flow of oil), so that only a fractional part of the oil is decomposed each time it passes into the retort or decomposing vessel, and the oil and condensed undecomposed products would be employed to wash the gas and carry back into the decomposing vessel the undecomposed portion of the oily products for further decomposition. If the invention were practised in conjunction with the manufacture of water gas, and when the mineral oils to be decomposed were very crude and tarry (containing a large excess of carbon in their composition), the water-gas plant should, in order to carry out the process, be so constructed that the oil and returned undecomposed products would flow, or be pumped back, into the water-gas producer, so that the excess of carbon might be there deposited as solid carbon, to be utilized in the reheating of the upper internal walls of the decomposing chamber, or in the production of water gas. In decomposing such tarry mineral oils in externally-heated retorts, it is found that ordinary fire-brick retorts may be employed, and that the process may be conducted in conjunction with the production of gas from coal.

Before specifying their claims, the patentees say they are aware that, in the manufacture of oil gas, the tar and oil which has unavoidably escaped decomposition when the oil has been distilled at a comparatively high temperature, has been returned with the fresh oil into the retort, to there undergo further decomposition. They are also aware that it has been proposed to wash oil gas with oil; and that oil has been extensively used to wash the hydrocarbons out of gas produced in shale-oil works, and benzole out of gases produced from coal. They therefore desire to restrict their claims accordingly. These claims are: (1) The improved method of decomposing mineral oils for the production of illuminating gas, consisting in repeatedly subjecting them to the action of heat (preferably radiant heat), of a temperature so low that only a part of the oils will be decomposed each time they are passed into the retort or decomposing vessel; the rate of flow into the retort or decomposing vessel being so regulated in accordance with the externally-applied temperature, as to restrict the internal temperatures to those suited for the partial gasification of the particular oil being decomposed. (2) The improved method of fractionally effecting the decomposition of mineral oils for the production of illuminating gas, by causing the oil to flow into and through the retort or decomposing vessel in an opposite direction to the outflow of the products of decomposition; so that the oil is subjected to higher temperatures and for longer times as the boiling-point rises. (3) The improved method of washing the products resulting from the decomposition of mineral oils in the production of gas, by the oil to be subsequently decomposed, and whereby the imperfectly decomposed portion is continually washed back through the condensing arrangement and the hydraulic main, and down the stand-pipe, into the retort, till the oil is completely split up into gas of the desired permanency and hard solid carbon or pitch.

Gas-Engines.—Webb, W. le P., of Cheltenham. No. 11,928; June 27, 1892.

This invention relates to improved methods of starting, governing, and lubricating gas-engines of the two-cycle type—that is, having an impulse at every revolution of the crank. The cylinder is made with two diameters; and with a piston of two diameters working therein. The smaller diameter is the motor cylinder, in which the explosion takes place. The larger diameter is the pump-cylinder, into which the charge is drawn on the forward stroke. On the return stroke, this

charge is forced through a non-return valve, fitted in the piston into the smaller diameter—carrying before it, and forcing out, the burnt products from the previous explosion, until the exhaust-valve closes. On being further compressed, it is then ignited as the crank passes over the back centre.

Governing is effected in the following manner: A cam, rotated by the engine, is made with a gradual rise and relatively sudden fall or incline. Working on this cam is (say) a lever, which is connected to one of the strikers of the gas-valve, worked to-and-fro by a separate cam. When the engine is working at or under its normal speed, the lever slides down the incline or cam, as the latter revolves; and the strikers then engage, opening the gas-valve and admitting gas to the engine cylinder. When, however, the speed of the engine increases, the lever has not time to slide down the incline on the cam, but drops a little later; thus preventing the strikers engaging. In this case, the gas is not admitted into the engine cylinder; the result being that the speed of the engine is decreased. The speed may be varied by a spring or weight attached to the lever, or by making the incline or cam more or less sudden.

To start the engine, the crank is set on the impulse stroke, somewhat in advance of the dead centre; and it is fixed in this position by a brake or stop—on the flywheel preferably. Communication is shut off between the cylinder and igniter; and air and gas (or air only, if gas is admitted into the cylinder beforehand at atmospheric pressure) are forced into the motor cylinder to any desired pressure. The brake or stop is then removed, and communication made between the cylinder and the igniter—thus firing the charge and starting the engine, which immediately resumes its ordinary cycle.

Prepayment Gas-Meters.—Anderson, J., of Partick, near Glasgow. No. 13,079; July 16, 1892.

This invention has reference to the construction of automatic coin-freed or prepayment gas-meters; the improvements consisting in utilizing the ordinary dry gas-meter and bellows with valves and connected counting mechanism, and in fitting a regulating-valve in an inlet chamber or duct through which the gas must pass, and which valve will be automatically opened against the action of a spring to permit a measured quantity of gas passing to the meter on the insertion of a prescribed coin, and the action of which will put into motion intermediate mechanism that will actuate the valve-spindle, and keep the valve open for the time-space necessary to permit the prescribed quantity of gas to pass.

Under one arrangement, the measuring inlet-valve is formed as a horizontal disc-valve, working upwards against a circular gas-passage seat in the inlet chamber or duct. It is connected to the bottom end of a vertical spindle, passing out through a stuffing-box to the outer chamber of the mechanism; the lowering or raising of the spindle respectively opening or closing the valve. A horizontal plate is fitted in the upper part of the meter-case, carrying the improved mechanism; and a rotating vertical spindle is fitted between this plate and an overhung bracket above. A spur or toothed wheel is keyed on this spindle, and gears with a screw-worm formed on the end of the usual horizontal spindle connected with the meter-index mechanism, and actuating the gearing-wheels of the ordinary recording mechanism. A loose spur or toothed wheel is also mounted on this vertical spindle below the fixed wheel; and the facing surfaces of both wheels are formed with a single angle-faced lateral stop-tooth, while a collar-boss, with a vertical groove in it, is fitted on the upper axis of the loose wheel, so as to permit of its being raised up a certain distance on a projecting pin on the under surface of the upper fixed wheel. A spring arm is fitted on the bottom plate, with a collar-boss round the vertical spindle, and having its free end formed forked or slotted. This end of the arm bears through a slot in the plate, on the upper boss end of the gas regulating valve-spindle, so as to depress the spindle and open the valve to permit the measured quantity of gas to pass. After this, the recoil of a spring arm surrounding the upper part of the valve-spindle will act on and raise the forked arm above the spindle; the slot of the loose wheel being in touch with the pin on the upper fixed wheel at this period, during which the inlet-valve is shut. A spring pawl or detent is fitted to engage with the teeth of the loosely-mounted toothed wheel; and it is connected preferably through a double-armed lever and link to a reciprocating crosshead. A longitudinal rod is attached to this crosshead, so as to reciprocate through guides behind it; while a forward projecting plate or arm is attached to the upper end of the crosshead, and has a spring attachment below, to permit of a slight yielding movement of the plate when it is acted on by the upper edge of a coin. A horizontal reciprocating tube or rod, with a pushing knob on its outer end, is fitted through a socket or guide-tube in the front of the meter-case; and a vertical plate-frame, with doubled or overlapping ends, is fitted on the inner end of the rod, to receive the coin after it has dropped through the slot, and guide it along the central stepped or toothed horizontal stem of an under concave plate. The coin is received at the inward travel of its motion into a lower curved or angled shoot, which guides it into the collecting chamber placed at the side of the meter-case, fitted with a locking device. A separate parallel-acting index-rod reciprocates in unison with the coin-pushing rod, and has an adjustable sliding plate secured over it. A pointer is attached to this sliding plate; and the distance of travel is regulated by the distance fixed between the end of the index-rod and its sliding plate. This is adjusted under one arrangement by a screw pin on the rod, and a socket screwed over it and bearing on the overlapping edges of the sliding plate. An index-plate, with scale lineal divisions, to indicate cubical measurements—such as 10 to 40 feet—is placed on the meter alongside the pointer, with an inspection window in front; so that the distance of travel of the rod can, according to these measurements, be regulated to suit the varying price of gas in any district.

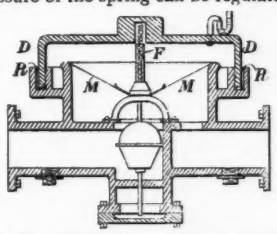
To operate the meter and obtain a measured supply of gas, a penny or other fixed coin is inserted through the vertical slot in the upper part of the meter-case; but the coin will not descend until the knob and reciprocating-rod, with the coin-receiving frame, have been drawn under the slot, and the top spring plate on the reciprocating crosshead has come forward and pushed back a spring plate under the slot, and permitted the coin to drop through. The outward travel of the coin-receiving frame will also have brought forward the reciprocating-rod, carrying the index pointer to the zero position. An inward projection on this index-carrying rod will act on a projection on the reciprocating crosshead, and bring it forward to the required distance; and this forward movement of the crosshead will have acted on the lever, and made the pawl slip over the teeth of the toothed wheel the distance of travel desired. After the coin has been properly inserted through the slot into its carrying-frame, the knob and frame are pushed inwards; and the top edge of the coin is thus held down by the reciprocating spring plate projecting from the crosshead. Its bottom edge slips over the central rack on the bottom plate (and is prevented being drawn back by the rack teeth), until it has reached its extreme inward position, where it falls through an opening into an angled shoot, which delivers it into the locked collecting-box. The inward travel of the reciprocating crosshead will, by the action of the coin, have operated the pawl lever and turned the lower toothed wheel round the distance of travel of the pawl and lever; and this action will have freed the upper wheel, and have pressed down the forked arm and valve-spindle, so as to open the inlet-valve for the gas to pass into the gasholder. The passage of the gas into the usual holder will, through its usual valves and mechanism, operate the ordinary counting and recording mechanism; and the turning of the horizontal main spindle will, through the additional worm on its end, operate the fixed toothed wheel on the vertical spindle, and turn this wheel until the projecting stop-tooth on it comes against the corresponding tooth on the loose wheel, so as to operate the inlet-valve. When the notch at its boss has entered the groove in the boss of the loose wheel, the inlet gas-valve will be closed, and the measured supply of gas will be delivered into the holder for the consumer's supply; and this action will automatically go on intermittently and sequentially on the insertion of each additional coin.

Incandescent Lamps.—Fried, B., of Budapest, Austria. No. 23,657; Dec. 22, 1892.

This is a combination of an Auer von Welsbach "mantle" with a spirit-lamp, so arranged as to generate gas in the cistern of the lamp in just sufficient quantity for the intensity of the light required, and which gas generation is continued during the whole time the lamp is burning. Inside the lamp-cistern is a star-shaped tube, the under end of which is open, while the ends of its other branches or arms are hermetically closed. In the space underneath the cistern, a spirit-lamp is placed; the flame being regulated so that the intensity of the flame may be as desired.

Gas Pressure Regulators.—Boult, A. J.; communicated from F. Stahlschmidt, of Haspe, Westphalia. No. 10,223; May 23, 1893.

In this appliance, the gas-pressure is regulated by means of a diaphragm M, under the direct action of springs F. The cover D of the casing, within which the regulating mechanism is arranged, is adjustable by a screw-thread, and keeps the regulator completely tight by means of a liquid seal R containing mercury. By adjusting the cover, the pressure of the spring can be regulated.



Alluding to his invention, the patentee says: The regulating mechanism being arranged inside the cover above the diaphragm, it is contrary to the usual delicate spring and lever mechanisms which are arranged beneath the membrane, and are inaccessible when not taken apart. It also has the advantage of absolutely locking the gas, in consequence of the arrangement of the cover, which can be moved up and down in an invariable liquid seal; but it has not the disadvantage of those systems in which the mercury is gradually attacked by the chemical ingredients of the gas, whereby the free operation of the regulator is reduced.

Valve-Gear for Gas-Engines.—Abel, C. D.; communicated from the Gas Motoren-Fabrik Deutz, of Deutz, Germany. No. 10,274; May 24, 1893.

In patent No. 4164 of 1890 was described an arrangement of valve-gear for gas-motor engines, which was controlled by an inertia or pendulum governor, for regulating the power of the engine in such a manner that the gas-supply valve was kept closed when the engine was running too fast, while at the same time the discharge-valve was kept open. The present invention relates to a similar construction of valve-gear, arranged to be controlled by a centrifugal governor.

APPLICATIONS FOR LETTERS PATENT.

13,482.—Lake, H. H., "Manufacture of gas." A communication from A. C. Humphreys. July 11.

13,487.—Hearne, J., and Strong, W. J., "Centre-valves for gas-purifiers." July 11.

13,518.—Fiddes, A. and F. A., "Gas and vapour motor engines and the like." July 12.

13,636.—Thomas, J., and Woolf, T. W. G., "Gas-lamps." July 13.

13,764.—Oulton, G., "Water-service apparatus." July 15.

Buenos Ayres (New) Gas Company, Limited.—The Directors of this Company have declared an interim dividend at the rate of 2 per cent. per annum for the six months ending the 30th ult.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Monday, July 17.

LONDON COUNTY COUNCIL (GENERAL POWERS) BILL.

On the motion for the third reading of this Bill,

Lord HOBHOUSE moved an amendment, the object of which was to obtain the re-insertion of the clause struck out by the Select Committee providing that the Thames Conservancy Board should be increased from 23 to 27 members, and that four members should be elected to the Board by the London County Council.* The Conservancy Board, he said, had large powers of regulation over the access to the river, its flow and volume, its purity, and its use for navigation and recreation. The Thames flowed through London for 20 miles; 2½ millions of Londoners used its waters for domestic purposes; and its management therefore deeply affected the health and convenience of the whole community. The request of the County Council that it should be represented on the Conservancy Board was most reasonable, and was likely to conduce to the public welfare. He anticipated a general assent to the proposition that, when they had a public administrative body framed on the principle of representing a diversity of interests, it was reasonable that the largest of all the interests should be represented on that body. The Thames Conservancy Board at present comprised representatives of the City (which he hoped would not be confused with London), the riparian owners, public authorities concerned in navigation and trade, and various private proprietors who were in the habit of using the river. When the Bill was submitted to the Treasury, they considered it a very ambitious measure; and they "pruned" it to a certain extent. But they did not strike out this clause; and he failed to understand what real objection could be offered to the proposal that the Council should be represented on the Thames Conservancy. There was not the smallest pretence for saying that the Council had set up a claim to exclude anybody. All they sought was to have a voice in an affair which so concerned them. The claim of the riparian owners was, no doubt, good; but it was a claim which was only put forward for the purpose of excluding the Council. The Committee of the House of Commons said distinctly that they could not deal with a claim which was not substantially put forward; and it should be remembered that the other House had the whole matter before them. He urged upon their Lordships that there were far greater reasons in favour of the proposals of the Council than there were against them; and, the hope which had been held out of a comprehensive inquiry having proved futile hitherto, he trusted they might not again be put off with a promise of a reconstruction of the Thames Conservancy Board, which, in his belief, would be more likely brought about by the infusion into it of new energy and new elements.

The Duke of RICHMOND remarked that he was at a loss to know whom the noble Lord represented. He supposed he represented himself alone, as he could not imagine that he had received any instructions to act on behalf of the London County Council.

Lord HOBHOUSE said he was instructed by the Council, and was asked to move the amendment.

The Duke of RICHMOND said he should ask the House to reject the amendment, and to adhere to the report of the Committee, which was unanimously arrived at. The House ought not to refuse to endorse the decision of the Committee, unless it could be shown that there was strong ground for doing so. He might say that, in his opinion, the Thames Conservancy Board, who had 200 miles of the river under their control, had done their work well. Similar proposals to the one now put forward had been rejected by Parliament, because it was felt that the constitution of the Board ought not to be altered by a Private Bill. No alteration should be made in the constitution of the Board without full public inquiry, at which all the parties interested could be heard, being previously held. The Surrey County Council had an equal claim to be represented on the Board with the London County Council. He asked their Lordships to reject the proposal.

Lord THRING remarked that several other riparian counties desired to be represented upon the Conservancy. No doubt circumstances had greatly altered since the Board was first constituted; and therefore alterations in its constitution ought to be carried into effect.

Lord FARRER thought he could promise that the London County Council would do their best to secure the Surrey County Council adequate representation upon the Board. The Thames Conservancy was first established by a general movement in favour of placing the management of the navigation of great rivers in the hands of the representatives of trade; and he wished to dissociate himself from certain wild schemes which had been promulgated for giving the London County Council the management of the lower river. Experience pointed in another direction—the establishing of separate Conservancy Boards for the management of the upper and lower rivers. The Commissioners from whom the Thames Conservancy were afterwards asked to take over the management of the upper river were in a hopeless and insolvent condition. He did not complain of the way in which the Conservancy had discharged the duties they then undertook; but if the London County Council and other such bodies had been in existence at that time, the upper river would not have been placed in the hands of the Conservators. In order to improve their financial position, the Conservancy came to an arrangement with the Water Companies by which they were to receive an annual grant from the Companies for keeping the river pure. This grant at present amounted to £18,000; but very little of it was spent in purifying the Thames. The paramount interest in the Thames was that of the London water consumers, who derived their largest supply from the Thames; but there was no one on the Conservancy Board to represent this interest. It was objected that the London County Council could not protect the purity of the river because they poured their own sewage into the stream. But there was this difference—Londoners drank the water which might be polluted in the upper reaches; but no one drank that which was polluted by the London sewage. If four representatives of the Council were placed on the Board, they could not extend its jurisdiction or increase its financial resources; but they could see that it did all in its power to secure the purity of the Thames, and they could prepare the way for the new Board which must be established. There was a strong feeling in favour of this representation among the members of the London County Council; and it would cause him deep regret if the Council felt that their interests did not receive full consideration in the House of Lords. As one who was personally acquainted with several members of their Lordships' Committee, he knew that such an impression would be entirely unfounded.

The Earl of MORLEY said the point really before the House was not much affected by the speeches which had been made in favour of the amendment. The question was whether the House was prepared to cancel the decision of its Committee. This course was very rarely taken, and only when it was quite clear that important evidence had been unheard, or that by some accident a decision had been given against the evidence. Nothing of the kind was alleged in the present instance. An able and patient Committee had the whole case before them; and it would be a mistake if their Lordships reversed the decision of the Committee on a mere *ex parte* statement. He believed the London County Council, and other public bodies as well, ought to have representation on the Thames Conservancy Board. But that one of these bodies should, by a Private Bill of its own promotion, introduce its representatives without the representatives of other bodies, and so upset the balance on the Board, was an altogether wrong principle. The constitution of the Thames Conservancy Board was a proper subject for public inquiry, when every interest could be adequately represented; but since its first establishment, the Board had always been altered by Public Bills.

Lord HOBHOUSE said that, in view of what had fallen from the Chairman of Committees (Lord Morley), and of the evident feeling of the House, he should not press his amendment. He would, however, urge the Government to give speedy consideration to this subject, with a view to instituting the public inquiry to which reference had been made.

The amendment was then by leave withdrawn; and the Bill was read the third time and passed.

*See JOURNAL for June 20, p. 1160.

The following progress was made with Bills last week:—

Bills read the third time and passed: Aberdeen Corporation Bill; London County Council (General Powers) Bill; Water Provisional Orders Bill (No. 2).

HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Bills read a second time and committed: Burghs Gas Supply (Scotland) Act, 1876, Amendment Bill.

Bills read the third time and passed: Accrington Gas and Water Bill; Belfast Water Bill; Bilston Commissioners (Water) Bill; Frimley and Farnborough District Water Bill.

The New Water Supply for Newark.—Last Thursday, the inhabitants of Newark had their first opportunity of testing the quality of the new water supply which the Corporation have secured at a cost of upwards of £50,000. The mains from Edingley to Newark, *viâ* Farnsfield, Upton, and Averham, having been completed, a junction with the old pipes was made at the Newark end. A temporary supply is now available, which, until the whole undertaking is finished, will be augmented from the old works at Muskham.

The Financial Position of the Stratford-upon-Avon Water Undertaking.—At the meeting of the Stratford-upon-Avon Town Council on the 11th inst., the report presented by the Water Committee embodied one by a Special Sub-Committee appointed to revise the water charges. It was shown that for 1889-90 the deficit on the undertaking, chargeable to the general district rate, was £690; for 1890-1, £1029; and for 1891-2, £799. For the removal or abatement of this annual burden on the rates, the Committee made certain suggestions, whereby they thought this annual loss would be at least minimized without operating unfairly on any class of consumers. In moving the adoption of the reports, Alderman Colbourne said that, ever since the opening of the water-works, trade consumers had been supplied at a price for which the water could not be obtained; and they thought the time had now arrived when they should relieve the district rate of some of its liabilities. Mr. R. Hawkes seconded the motion; and the reports were adopted without discussion.

The Price of Gas at Rawmarsh.—At the last monthly meeting of the Rawmarsh Local Board, Mr. Walker moved that the price of gas be reduced 3d. per 1000 cubic feet. He mentioned that the profits last year were £600. They had now every appliance, the gas-works were in better order, and there were greater prospects of profit. He thought, therefore, they would have improved results in the ensuing twelve months. Under these circumstances, he was of opinion that the Board would be justified in the reduction. Mr. Dickinson seconded the motion. Mr. Phillips moved, as an amendment, that the question be referred to the Gas Committee. He said he was quite in favour of a reduction, but there was a proper way to go about making it. Mr. Dickinson said he had no objection to the question being referred to the Committee; but he considered the time had arrived when something should be done. Mr. Spick thought they would be running themselves very closely indeed if they reduced the price. He seconded Mr. Phillips's amendment. Mr. Phillips argued that, before the price of gas was reduced, the money taken from the general district rate—a sum of £1500—should be repaid. If it had not been for this, the balance on the gas-works account would have been on the wrong side. This was his reason for wishing the question referred to the Committee. After some further conversation, a vote was taken, when the numbers were equal. The Chairman (Mr. F. Hall) then gave his casting vote in favour of the motion, and declared it carried.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.
Monday, July 17.

(*Before Justices* CAVE *and* WRIGHT.)

Corporation of Southport v. Assessment Committee of the Ormskirk Union and the Overseers of Birkdale.

As briefly recorded in the last number of the JOURNAL, judgment was delivered to-day on a special case raising the question of the liability of the Southport Corporation, as owners of the gas-works in that town, to be assessed to the poor-rate in respect of mains in the township of Birkdale, of which they have the use for the purpose of supplying gas. The case was argued on the 10th inst.; but the matter in dispute had previously been before the Court.*

Mr. LEESE, Q.C., and Mr. S. T. EVANS appeared for the appellants; Mr. A. T. LAWRENCE for the respondents.

The case set forth as follows: The mayor, aldermen, and burgesses of the borough of Southport, the appellants, are the owners and occupiers of gas-works in the borough of Southport, and are empowered by statute to supply gas in the township of Birkdale. By section 43 of the Southport Improvement Act, 1871, it is enacted as follows: "The Local Board [which means the Local Board of the township of Birkdale] shall have the exclusive right, except as hereinafter provided, of laying gas mains and pipes within the township, and shall for ever hereafter keep their present and future gas-mains and the public lamps in the township in good repair and condition, and shall afford the Corporation [that is, the Corporation of Southport] the use of the same for the supply of gas for public and private purposes within the township. In consideration thereof, the Corporation shall pay to the Local Board 4½d. for every 1000 cubic feet of gas supplied by the Corporation to private consumers within the township; and, in consideration of the power conferred by this Act upon the Corporation to supply gas within the township, the Corporation shall also pay to the Local Board 3½d. for every 1000 cubic feet of gas supplied by the Corporation within the township to private consumers, such respective payments to be made quarterly." On June 23, 1892, the appellants were assessed and rated as occupiers of the gas mains and pipes in the township of Birkdale in a rate for the relief of the poor and for other purposes. The respondents, who are the Assessment Committee of the Ormskirk Union, contend that the appellants are the occupiers of, and are rateable to the poor-rate in respect of, the gas mains and pipes in the township. The appellants contend that they are not the occupiers of the mains and pipes, but have a mere easement or right of enjoyment, in virtue of the above section of their Local Act; and that therefore they are not assessable or rateable to the poor-rate. The Local Board of Birkdale have laid gas mains and pipes within the township, and have kept and keep them in good repair and condition, and afford the Corporation the use thereof for the supply of gas within the township, in accordance with the provisions of the Act. The mains are not, as a matter of fact, used for any purpose other than that for which they are used by the appellants. The appellants have up to the present time made the service connections with the mains, except for the public lamps in the township; they provide and lay the service-pipes from the mains to the premises of the consumers, the cost of connections and pipes being paid by the consumers; and the appellants keep all the service-pipes in repair, and also charge and collect all gas-rents.

Justice CAVE, in giving judgment, said the question before the Court was whether the Corporation of Southport were liable to be rated to the poor-rate in respect of the occupation by them of certain pipes, by which they were to supply gas to the township of Birkdale. The case arose under section 43 of the Southport Improvement Act, 1871, which provided that the Local Board of Birkdale should have the exclusive right, except as thereinafter provided, to lay gas mains and pipes in the township; that they should keep them in repair; and that, in consideration thereof, the Corporation should pay the Board a certain sum for every thousand cubic feet of gas supplied. The question, therefore, was whether the Corporation were the occupiers of these pipes. It was obvious, from the section, that the Local Board were the owners of the mains; and *primâ facie*, as owners, they were entitled to the occupation, and were the occupiers. They might, however, like every other owner, part with the occupation of their property for a limited time; and the question was whether or not they had done this by virtue of the statute, so as to constitute the Corporation the occupiers of the pipes. A number of cases had been cited; and in these one always had to guard oneself against allowing too much weight to be given to the cases themselves, and not enough to the principles underlying them. That principle he took to be this—that, *primâ facie*, the owner was the occupier, but that he might divest himself of his occupation; and in each case the question was whether or not he had done so. "Ownership" and "occupation" were the names given to certain bundles of rights. A man who was both owner and occupier possessed, roughly speaking, all the rights which attached to a certain portion of land which he owned and occupied. When he let off that land, he divested himself of some of those rights, and retained others. When he granted a right of way or other easement over the land, he again divested himself of certain rights—retaining others. When did he divest himself of the right of occupation, and when did he retain it? He (Justice Cave) thought the cases would all be found to go upon this—that, so long as a man who was owner and occupier only granted away certain limited rights, reserving to himself all the rights except those which he so granted away, he retained the occupation, and the grantee obtained merely the limited right granted to him. Where, on the other hand, he granted away his rights generally, though only for a limited time, then, though he might reserve something to himself, he ceased to be the occupier, and the person to whom the general rights were given was the occupier. Applying this principle to the particular case before the Court, the result was that the Local Board of Birkdale were the owners of the gas-mains, and they had granted—or the Act of Parliament had granted for them—to the Corporation the use thereof, not generally, but simply for the supply of gas. So that all that was taken out of the Local Board was the use of the mains for a particular purpose—the supply of gas, and nothing else. All other rights except this remained where they were originally, in the Local Board. It made it a little more difficult to understand in this case that *primâ facie* the use of the mains for the supply of gas was the only use of them which was contemplated; but he did not think this would affect the decision. When a man took in cattle to graze on his land, it might be that he took in as many as the land would feed, and consequently that he could not contemplate any other use of the land. Still he remained the occupier; and the person whose cattle were taken in did not become the occupier. His right was a strictly limited one; and the right of occupation remained in the person who took the cattle. So in the present case it seemed to him that the rights of the Corporation were strictly defined, and were limited to the use of the pipes for the purpose of delivering their gas; and all other rights connected with the possession remained in the Local Board. They were bound to repair them; they might take them up and relay them when necessary; and they might alter their direction to a certain extent. There was no definite portion of land, therefore, of which the Corporation had the occupation. They had the right to send their gas through the mains wherever they might happen for the time to be. This was the only right they had—a strictly limited and defined right; and therefore, in his judgment, they came within the general rule. The Corporation were not occupiers, and consequently were not liable to be rated to the poor for the occupation of these pipes.

Justice WRIGHT said he was of the same opinion. The substance of a case was always to be looked at. Here there were no words purporting to give occupation of the pipes to the Corporation; and he thought the Local Board had taken the greatest pains to prevent the Corporation being actually possessed of any part of the soil or pipes within their territory. To his mind it was clear that the Corporation could not, and the Local Board alone could, maintain trespass for any injury done to the pipes; and it was expressly provided that the Board alone should lay, repair, and maintain them.

Application being made for leave to appeal,

Justice CAVE said he did not know that leave was necessary. If, however, it were found to be, Counsel might mention the case again.

The Queen v. The Staines Union and the Local Board of Staines.

In this case a rule *nisi* had been obtained by the Local Government Board, calling upon the Staines Union and the Local Board of Staines to show cause why a writ of *mandamus* should not issue commanding them to obey an order of the applicants to perform their duty in connection with the execution of certain works necessary for the proper drainage of Sunbury; and arguments were now heard as to whether or not the rule should be made absolute.

Sir HENRY JAMES, Q.C., Mr. CHANNELL, Q.C., and Mr. TINDAL ATKINSON appeared to show cause against the rule being made absolute; while the ATTORNEY-GENERAL (Sir C. Russell, Q.C., M.P.) and Mr. SUTTON supported it.

Mr. CHANNELL, in showing cause against the rule, said the application was made under section 299 of the Public Health Act, 1875, which provided that, when complaint was lodged that a local authority had made default in providing their district with sufficient sewers, the Local Government Board, if satisfied, after due inquiry, that the authority had been guilty of the alleged default, might make an order commanding them to perform their duty, and if they failed to obey the order, the Board might enforce it either by *mandamus* or by directing some person to carry out the works, and charging the authority with the expense. He submitted that the Local Government Board had not held a "due inquiry" into all the matters affecting the construction of the new sewers, as provided by the Act.

Justice CAVE said there had been an inquiry which satisfied the Local Government Board; and it was not for the Court to say if every particle of evidence had been considered by the Board.

Mr. CHANNELL said, in the opinion of his clients, there were difficulties in the way of carrying out the order. He asked their Lordships, in the exercise of their discretion, not to make the rule for a *mandamus* absolute, but to leave the Local Government Board to carry out the works, and charge his clients with the expense.

Sir H. JAMES also suggested that the Local Government Board should execute the works, and charge the Local Authorities with the expense.

The ATTORNEY-GENERAL said the Local Government Board did not desire to carry out such works. He believed that if their Lordships made the rule absolute the Local Authorities would execute them.

Justice CAVE said he was of opinion that the rule ought to be made absolute. It seemed to him that they would be travelling far beyond their duty if they attempted to prevent the Local Government Board from discharging the powers imposed upon them by the Legislature.

Justice WRIGHT concurred.

Rule made absolute accordingly.

OFFICIAL REFEREE'S COURT.—Tuesday, July 18.

(*Before Mr.* RIDLEY, Q.C.)

Wellby v. South Metropolitan Gas Company.

The action brought by Mrs. Wellby and two of her tenants, to recover compensation for injuries alleged to have been caused by the negligence of the defendants in allowing gases to escape from the sulphate-house, came to-day before the Official Referee for the assessment of damages under the order of the Court. The matter, it may be remembered, was before Mr. Justice North on the 10th ult.*

* See JOURNAL, Vol. LIX., p. 252.

* See JOURNAL, Vol. LXI., p. 1109.

Mr. HICKLIN, who appeared for the defendants, said he was not prepared to go on, as the particulars of the damage had only just been delivered.

Mr. OSWALD, Q.C. (with him Mr. POCHIN), for the applicants, remarked that the matter was a very small one.

Mr. HICKLIN said it was not a small matter to the Company. If all the tenants on the estate brought similar actions, it would amount to very many thousands of pounds.

Mr. OSWALD thought that if the Company met in a fair spirit all the tenants who had suffered, there would be no more actions.

Mr. RIDLEY asked the amount of the claim.

Mr. OSWALD replied that each tenant had made a claim for £30. He thought it ridiculous that the Company should fight so small a matter. He might mention that there were 500 houses on the estate; and it was fortunate for the Company that these were owned by two persons instead of 500, as thereby only two actions were necessary. Mrs. Chapman's action, which was first in point of date, was assigned to the Court of Mr. Justice Stirling. On the 7th of March, 1892, Mrs. Wellby brought her action by two of her tenants; and this was assigned to the Court of Mr. Justice North. The action was stayed until after Mrs. Chapman's action had been heard. The only expense incurred, therefore, was the issue of the writ; and it had been arranged that judgment should go for Mrs. Wellby for one-half the amount awarded to Mrs. Chapman. The only thing that remained now was the claim by the two tenants.

Mr. HICKLIN said if the two tenants stood alone, the matter would not be worth disputing; but if every other tenant on the estate was going to bring an action, it would be a serious thing for the Company. The particulars of the articles alleged to have been damaged had only just been given. But it appeared that every piece of rust was put down to the Company; and, if time were given, he should be able to show, by skilled persons, that the Company had nothing whatever to do with the injuries. The present was really a test case; and he wished for an adjournment in order to instruct Counsel, and to inspect the articles alleged to have been injured.

Mr. RIDLEY thought it little short of a scandal that an adjournment should be asked for.

After some further discussion, the Official Referee refused to accede to the request.

Mr. HICKLIN thereupon declined to take further part in the proceedings.

Mr. OSWALD then called

Mr. *T. A. Stone Berry*, who claimed in respect of 72, Credon Road. He deposed that, after the erection of the sulphate-house, his family suffered considerable discomfort from the noxious vapours which escaped. His children became sick; the picture-frames turned black; and all brass ornaments were discoloured. Witness gave a detailed list of the articles in respect of which he claimed £30.

Mr. *W. Loveland*, of 78, Credon Road, the second claimant, also mentioned the articles in respect of which he claimed; one item being damage to a pianoforte, the strings having been blackened. He estimated his damage at £30.

Mr. RIDLEY said he should report to the Court that he assessed the damage in the first case at £30, and in the second case at £25. If the Company wished to question his finding, they could do so when the matter came before Lord Justice Smith.

WESTMINSTER COUNTY COURT.—Monday, July 10.

(*Before Mr.* LUMLEY SMITH, Q.C., *Judge.*)

London County Council v. Vestry of St. Luke's—The Repair of Fire Hydrants.

This was a test action, brought on behalf of the London County Council, who sought to recover £1 4s. 3d. for work done by them to a fire hydrant, for which it was alleged defendants were liable to pay, in accordance with the provisions of the Water-Works Clauses Act, 1847.

Mr. W. E. HARRISON appeared on behalf of the County Council; Mr. G. LYON conducted the case for the Vestry.

Mr. HARRISON, in opening the case, said the claim was for work done to two hydrants situated in Wharf Road, City Road; and the dispute arose in the following manner: It appeared that the hydrants were fixed by the Metropolitan Board of Works about the year 1887, and were paid for by the New River Company, after having been tested and found to be in good working order. They remained in the same position until 1892, during which year the Vestry of St. Luke's raised the level of their footway, and thus rendered it necessary to raise the hydrants also. A letter was received by the Council requesting them to carry out the necessary work; and they wrote back to the Vestry Clerk of St. Luke's saying they were prepared to do so, but that the cost must be charged to the Vestry, in accordance with custom and with the provisions of the Water-Works Clauses Act, 1847. No answer was received to the letter; and accordingly the work was duly completed, and the sum of £1 4s. 3d. was paid to the Company, who did it under the instructions of the Council. In December of the same year an application was made to the Vestry for the amount; but they declined to pay on the ground that they were not liable under the Act. The learned Counsel then referred his Honour to sections 38, 39, and 40 of the Act, providing for the fixing and repair of fire hydrants, and the payment of the cost of repairs thereto by the Town Commissioners. He submitted that the work, which was necessitated by the act of the Vestry, had been carried out at their request, and that therefore the cost should be borne by them.

Mr. *M. C. Meaby*, Surveyor to the Vestry, said that in March, 1892, it became necessary to re-pave the road in question. The old line was adhered to as much as possible; only sufficient gradiant being given to allow the water to run off. In his opinion, the new work was not higher than the original pavement when it was first laid. When the new work was completed, the tops of the hydrants were about an inch below the level. It was quite possible for the hydrants to sink; but he did not think such a thing often happened.

Mr. *J. Veer* said he occasionally tested the two hydrants; and it was within his knowledge that, at the time the work was done, they were in perfect order.

Mr. LYON submitted that the County Council had at present entirely failed to prove any statutory liability on the part of the defendants. It was further submitted that when the Vestry put their footway into proper repair they had no power to interfere with the hydrants; and therefore it was abundantly clear that the County Council, under whose control the hydrants were, were the proper persons to be held liable for the cost.

His HONOUR said it appeared to him to be a question as to whether or not the Vestry were bound to raise or lower the level of their footways to suit the position of the hydrants.

Mr. HARRISON, replying on behalf of the County Council, contended that it had been proved that the footway in question had been in existence for at least fifty years; and in 1887 the Vestry allowed the Board of Works to put in a hydrant at the then level. But in 1892, when they could no longer shut their eyes to the worn-out condition of the pathway, they set about making a new one. Having raised the former level, and so lowered the position of the hydrant, they called upon the Council to pay for work thus rendered necessary.

After hearing the case argued at considerable length,

His HONOUR said that, as the question was one of great importance, and as the case was regarded rather as a test action, he would reserve judgment, in order that he might look into the various statutes and points of law.

The Electric Lighting Scheme of the Manchester Corporation.—The plant at the electric lighting station of the Manchester Corporation was tested with satisfactory results a few days ago; and arrangements are being made for the formal opening of the works at an early date. Some fifty shops, warehouses, &c., in and about Market Street have been coupled to the electric mains. The current was conveyed to the Town Hall, on the 14th inst., and turned on in some of the offices. In the presence of most of the members of the Gas Committee, the Lord Mayor (Alderman Marshall) switched on the light in the committee-room of the Gas Department.

Jones v. Conway and Colwyn Bay Joint Water Board.—In the Chancery Division of the High Court of Justice last Saturday, Mr. Justice Chitty had before him the above case, to which several references have been in the JOURNAL. It was an action in which the plaintiff, the owner of certain lands in the county of Carnarvon, sought to restrain the defendants from laying water-pipes through his property without complying with the provisions of the Public Health Act. An interim injunction had been obtained on motion, and the matter now came on as a short cause; the parties having agreed to an order under which the defendants are restrained from carrying out their works until the provisions of the Act have been satisfied, also to pay £5 for damages, and the costs. His Lordship made the order.

Shrewsbury Water Supply.—At a special meeting of the Shrewsbury Town Council on Monday last week, a report was read from a Committee of the whole Council who had considered the proposal of Mr. Stooke for supplying the town with water. The scheme appeared to the Committee to be well worthy of consideration; but, to test the supply, it would be necessary to sink a well at a cost of £750, which, however, would form part of the expenses of the whole scheme if it were eventually carried out. As the Council had already voted £800 to the Water Committee to inquire into the question of obtaining a supply from Church Stretton Hills, the Committee did not think it advisable to spend the necessary £750 in addition until the other Committee had reported as to the total cost of the Stretton scheme. The report was adopted, as was also one from the Water Committee, which stated that Mr. G. F. Deacon had reported very favourably as to the Stretton scheme. The investigations of the Borough Surveyor (Mr. W. C. Eddowes) being so far equally satisfactory, the Committee would proceed with all possible speed to obtain further infor mation as to the supply, the means of storing it, and of bringing it to the town.

The Electric Lighting Nuisance at Morecambe.—At the last monthly meeting of the Morecambe Local Board, a memorial was read from owners of property in the neighbourhood of the Electric Light Company's works, complaining of the noise caused by the machinery, and also of the noxious gas emitted from the works; and asking the Board to take up the matter, with the view of stopping the nuisance. A report was likewise presented from the Surveyor, who had visited the works on various occasions, and who expressed the opinion that the noise and smell were injurious to both the comfort and the pecuniary interests of the people residing in the immediate neighbourhood. The Medical Officer also reported upon the matter. He, however, stated that he did not find any nuisance whatever at the works. There was, he said, "always some noise caused by machinery in motion—that is inevitable;" and he should consider the barking of a dog or the crowing of a cock much worse. He enclosed a letter from the Company's Secretary (Mr. Jowett), in which an explanation was offered. While additions were being made to the gas-producing and electrical plant, it had, he said, been necessary to work night and day; but further all-night shifts would not be necessary for the present. With regard to the noise from the engines, he stated that this was only caused while the engines were being accurately gauged for their work; and the noise from the exhaust-pipes was being reduced as much as possible by the fixture of silencing boxes. The smells complained of were caused by the discharging of the contents of the gasholder into the air, while additional gas-making plant was being erected; and when the entire plant was at work there would be no offensive smell. There appeared to be a general agreement that the works were a nuisance; the only person to look upon the matter leniently being the Medical Officer of Health. This may be accounted for, if it was true, as stated by one speaker, that this official had only visited the place when the works were stopped. On the suggestion of the Clerk, it was resolved to send a copy of the memorial, reports, &c., to the Local Government Board, with a request for their observations thereon. As the Chairman (Mr. Lee) remarked, the Board have no remedy against the noise; but the other ground of complaint comes within their province as custodians of the public health.

MISCELLANEOUS NEWS.

THE EXAMINATIONS IN GAS MANUFACTURE.

The Pass List.

We have been favoured by the Superintendent of the Technological Examinations of the City and Guilds of London Institute (Sir Philip Magnus) with a list of the successful candidates in the last examination in "Gas Manufacture." Mr. Charles Hunt, M.Inst.C.E., was again the Examiner. The following are the names of those who passed; the towns in which they were examined being given in parentheses:—

HONOURS GRADE—

First Class.—Botley, C. F.* (Hastings); Gracie, H. H. (Edinburgh); Keyte, G. (London); Parkinson, B. R. (Birmingham); Taplay, J. G. (Hanley); Walmsley, R. (Wigan).

Second Class.—Greenaway, R. J. (Chacewater); Hearson, W. (Mansfield); Preston, O. J. (Bristol); Savage, W. (Crewe); Surtees, R. (Hanley).

ORDINARY GRADE—

First Class.—Arnold, F. H.† (Guernsey); Bedford, C. (London); Brearley, J. H. (Elland); Brett, C. G. (Sherborne); Buckley, J. H. (Southport); Davies, H. (Liverpool); Duxbury, T. H. (Darwen); Fearon, E. (Newcastle-on-Tyne); Hislop, L. (Glasgow); Hoyte, P. S. (Nottingham); Macwalter, N. J. (Dublin); Mogford, J.‡ (Cardiff); Moon, F. C.§ (Birmingham); Pettigrew, W. E. (Leeds); Tomlinson, E. B. (Wellington); Turton, H. (Liverpool).

Second Class.—Alexander, W. (Edinburgh); Copp, H. E. (Sheffield); Durkin, S. W. (Southampton); Higginson, F. (Elland); Hoggard, J. T. (Elland); Jackson, T. J. (Hanley); Martin, E. H. (London); Pegger, J. T. (York); Price, W. H. (Wellington, Salop); Saville, A. E. (Todmorden); Taplay, F. H. (Hanley); Tavernor, H. (Macclesfield); Thomas, C. W. (Sheffield); Walker, A. W. (Elland).

Mr. C. F. Botley, the silver medallist in the Honours Grade, is the son of Mr. C. E. Botley, Assoc.M.Inst.C.E., Engineer and Manager of the Hastings Gas Company. Having five years ago, when "going through the shops" at Swindon, gained the silver medal in the Ordinary Grade, he is entitled to the full technological certificate. He was subsequently engaged on gas-works plant, &c., and general engineering work in the drawing office at Swindon; and about eighteen months ago he became one of his father's assistants—succeeding Mr. Herring, who went to Huddersfield. He is a student of the Institution of Civil Engineers.

THE CRISIS IN THE COAL TRADE.

The determination of the Coalowners' Federation in Lancashire, Yorkshire, and the Midlands to reduce the miners' wages by 25 per cent., to which reference has already been made in the JOURNAL, was the prominent labour topic of the past week. The position was rendered complicated by the division among the men. The Miners' Federation declined to accept any reduction, and in some cases even demanded a slight increase in wages; whereas the Northumberland and Durham men refused to co-operate with the other members of the Federation, and threatened to sever their connection therewith rather than be forced to come out. A meeting of the Durham Miners' Association was held last Tuesday, when the result of the ballot of the county was made known. The question as to whether or not the men should join in a general strike was answered in the negative by 326 to 104; and the one as to assisting by a levy brought 212 negative and 125 affirmative replies—123 being neutral. Conciliation or else arbitration was preferred to a strike. The Bishop of Durham expressed his approval of the course taken by the men, and said they deserved well of their county and their country. He hoped their decision might turn the scale in favour of peace. Appearances, however, were against this, as with the exception of Northumberland, the voting in the other Federation districts was in favour of a contest. In Derbyshire, out of 18,000 men, only 50 were agreeable to accept the proposed reduction; and in Yorkshire, not 100 out of upwards of 50,000. South Wales however, was undecided. At a meeting of the Neath, Swansea, and Llanelly miners, at Swansea, the question of federation as against the South Wales and Monmouth sliding scale was discussed. It was stated that nineteen collieries had voted on the question, with the following result: For, 2210; against, 493—15 collieries declining to vote. It was decided to postpone the final settlement for three weeks.

The position of affairs when the Birmingham conference opened last Wednesday morning was this—that the men would neither accept the proposed reduction nor submit to arbitration. At this conference, which was conducted with closed doors, Mr. B. Pickard, M.P., President of the Federation, occupied the chair, and was supported by Mr. S. Woods, M.P., Mr. J. Wilson, M.P., Mr. C. Fenwick, M.P., Mr. T. Ashton, Secretary of the Federation, and other well-known labour representatives. All the morning was occupied in considering the reports from the various counties and districts. On reassembling in the afternoon, the Durham delegates reported that they had not really balloted the men, but had taken their opinions at their lodge meetings. They were in favour of settling the present wages dispute by arbitration. If the conference declined to accept arbitration, and a strike followed, the Durham men would be balloted on the question whether they would join the Federation districts in the strike. Northumberland made a similar report. Mr. Aspinwall (Lancashire) moved—"That this conference is opposed to any reduction in miners' wages at present." He contended that wages were low enough—that, in fact, men could not honestly live if they accepted less. Mr. Parrott (Yorkshire), in seconding the motion, said the employers were asking for a reduction because men in South Wales and the Northumberland and Durham districts had accepted decreased wages. He was in favour of the districts coming up to the Federation standard, instead of the Federation going down to theirs. Mr. Wilson, M.P., moved, as an amendment, that the present wages dispute be settled by arbitration. This was seconded by Mr. J. Johnstone (Durham). On a vote being taken, Mr. Aspinwall's motion was carried by votes representing 198,000 men, as against 50,000. Northumberland did not vote. Mr. Harvey (Derbyshire) next moved—"That this conference is of opinion that those districts which suffered reduction in wages, and which belong to the Miners' Federation of Great Britain, shall give notice for an advance in wages equal to the reduction suffered during the last two years. Districts failing to comply with this resolution shall not thereafter be considered members of the Federation." Mr. Cowey (Yorkshire) seconded the motion, which was opposed by Messrs. Wilson and Fenwick. On being put to the vote, it was carried by 199,000 to 50,000 votes—Northumberland again abstaining from voting. The conference then adjourned.

The proceedings were resumed on the following day, and were again conducted in private. According to the report officially furnished, the first resolution submitted was as follows: "That all workpeople shall refuse to fill up any coal that is now in stock during the strike, if such be declared." This was carried unanimously. A discussion next took place with reference to putting in force the 20th rule of the Federation, which states that, whenever a county or district of the Federation is attacked on the wages question, a conference shall be called, which shall decide whether or not all connected with the Federation shall cease working at the same time. Mr. Greenall (Lancashire) proposed the following motion: "That the men in the Federation districts who have not received notice of reduction, tender their notice on the next making-up day to terminate all contracts." This was opposed by Mr. Edwards (Midland Federation), and also by the Durham and Northumberland delegates. On being put to the vote, however, it was carried by delegates representing 149,000 against 101,000 miners. Delegates were appointed to join with the members of the Executive Committee in meeting the coalowners at the Westminster Palace Hotel the next morning, and in laying the case before them. Subsequently, a proposition was submitted that the coal porters of the United Kingdom should be called upon, when necessary, to refuse to unload coal coming from districts which disregard the rules of the conference, and recommending the Seamen's and Firemen's Federation to assist in carrying out this resolution. Mr. O'Connor, General Secretary of the Coal Porters' Union seconded the proposition, and it was carried unanimously. Votes of thanks were then accorded to the President and other officers, and the conference terminated.

Last Friday, a conference between the representative Committee of Coalowners in the districts embraced by the Miners' Federation and the Executive Committee of the Miners' Federation took place at the Westminster Palace Hotel, London, under the presidency of Mr. A. M. Chambers. The object of the meeting was to consider the present situation and the course to be adopted. The proceedings were conducted in private; the result being afterwards communicated to the Press. They were informed that Mr. Pickard, M.P., on behalf of the miners, resolutely refused arbitration and any reduction in the men's wages. The owners had, he said, "thrown down the gauntlet," and placed the representatives of the men in an awkward position. At the same time, he did not think there would be any bad blood among them. They would try to fight like men; and he could only hope, now that the war had broken out, that they would fight and meet again. The Chairman expressed regret at the answer of the men. He said it was a great pity that the request had received such a complete refusal. The offer of arbitration was still open. The reply now made would be laid before a general meeting of the colliery owners; and, if anything arose to make it desirable to have a further conference, it could be arranged. Whatever might be the result, he hoped they would be able to meet together when serious questions of this kind arose. Mr. Pickard reciprocated the feeling, and said he took it that the stern realities of war were before them. A vote of thanks was passed to the Chairman, and the meeting terminated. The miners' representatives subsequently had a meeting, and made arrangements for the impending struggle. They unanimously resolved to instruct the Secretary (Mr. T. Ashton) to impress upon the districts the necessity of carrying out the resolution come to at the Birmingham Conference as to giving notice in those cases where such a course had not been followed by the masters. They also deputed Mr. S. Woods, M.P., and Mr. Cowey to visit Scotland as a deputation from the Federation, to advocate the cause of the men.

Our Bolton Correspondent writes as follows on the position of affairs in Lancashire: The various District Councils connected with the Lancashire and Cheshire Miners' Federation held special meetings last Saturday, at which arrangements were made for withdrawing the men from the pits where notice had not been given. In Lancashire there are only about 3000 who have not received notice, and these will cease work next making-up day. In a large number of instances, the original notice expires on the 26th; but in the case of the Bridgewater Trustees, who employ 6000 men at their pits in the Worsley district, an extension has been arranged for by which contracts do not terminate until the 28th. It is computed that, in Lancashire and Cheshire, from 50,000 to 60,000 men will be idle this week-end; and this number will be considerably augmented the following week when the other notices expire. The statement circulated to the effect that the men's societies are in a better position financially than was the case in 1890 may apply to the larger associations connected with the Federation, but it does not apply generally by any means. The Manchester Miners' Association is said to have sufficient funds to bear a stoppage of six weeks; and the same remark applies to the Ashton and Haydock Society, which has a membership of 20,000. The Burnley branch, with less than 2000 members, has a reserve fund of more than £2000 to fall back upon; but, speaking generally, it cannot be said that the men are well prepared for a fight with capital. There is

* With the Salters' Company's Prize of £2, and the Institute's Silver Medal.
† With the Institute's Third Prize—a Bronze Medal.
‡ With the Salters' Company's Prize of £1, and the Institute's Silver Medal.
§ With the Salters' Company's Prize of £1, and the Institute's Second Prize—a Bronze Medal.

sure to be a good deal of privation entailed, if work is suspended for long. For some considerable time colliery owners have been accumulating large stocks; and therefore they are in a position to view with equanimity, and even satisfaction, a prolonged stoppage. At this stage, it is interesting to note that the advance in wages since April, 1888, when the men submitted to a 10 per cent. reduction, has been as follows: Oct. 4, 1888, 5 per cent.; Nov. 1, 1888, 5 per cent.; July 4, 1889, 5 per cent.; Oct. 5, 1889, 5 per cent.; Jan. 5, 1890, 10 per cent.; March 17, 1890, 5 per cent.; and Aug. 13, 1890, 5 per cent.

In a letter to *The Times* last Wednesday, Mr. A. M. Chambers, of the Thorncliffe Iron-Works and Collieries, corrected certain statements made by Mr. Pickard to reporters at Barnsley on the 15th inst. Mr. Pickard asserted that the Secretary of the Lancashire Coalowners' Association had made a statement to the effect that the coalowners were not asking for any reduction in wages at the present moment. Mr. T. Radcliffe Ellis, the gentleman referred to, denied that he ever made any such statement. Coming to the immediate subject of his letter, Mr. Chambers says: "Mr. Pickard also says that the coalowners are seeking a reduction of 25 per cent. on the present gross wages paid, and that this means a reduction of nearly 35 per cent. from the 40 per cent. at which the wages now stand upon the basis prices of 1888. This is a mistake, as I myself made the demand on behalf of the coalowners, and that demand was for a reduction of 25 per cent. from the 40 per cent. now in operation; leaving the percentage at 15 above the basis of 1888. The 40 per cent. advance which the miners of the Midland districts now have was put on in consequence of the improvement in trade which commenced in 1888, and reached the summit about the middle of 1890. Since then prices have been falling steadily up to the end of last year; but in the present year the collapse in demand and prices has been greater and more complete than at any previous time during the last forty years, so that a great many pits in the Midland counties have since February only been working two and three days a week. Now the point has been reached when the average selling prices are not more than 6d. to 1s. per ton in excess of those realized in 1888. The coalowners of the Midlands have avoided for as long as possible making any application for a reduction of wages; but the complete collapse above mentioned compels them now to do so. Mr. Pickard states: 'The owners having given themselves away to the local gas companies, and middlemen having, according to their own showing, had 1s. 6d. or 2s. per ton at their disposal, and not knowing exactly what to do with it, have considered it wiser to give the 1s. 6d. away rather than to try and tide over this year's difficulty.' This is an entirely gratuitous assertion, and has no foundation in fact. The coal trade of Great Britain, dealing with an annual quantity of nearly 180 million tons raised in different districts and under all kinds of varying circumstances, is too enormous to be dealt with as regards prices in an artificial manner. The coalowners do their best to get the highest prices which the market will give. These prices always have been, and always will be, governed by the law of supply and demand. Wages in other districts of the country outside the Midland districts have already been largely reduced. These reductions amount to 47½ per cent. in South Wales, 15 per cent. in Durham, 17½ per cent. in Northumberland, 20 per cent. in Cumberland (district in the federation), and 40 to 50 per cent. in Scotland. Many of these reductions have been in force from twelve months to two years; but in the Midland district the full advance is still given, and this has put the Midland coalowners at a great disadvantage as compared with the other districts, especially in competing for trade in distant markets. The coalowners, therefore, cannot be said to be unreasonable in asking for a gross reduction of 25 per cent., which means a net reduction of less than 20 per cent." Mr. Chambers cited figures to show the great decline which has taken place in the price of coal in the past three years; and he concluded by urging the reasonableness of a reduction in wages in the Midland district, from which a great deal of trade has already passed.

Gas, Water, and General Investment Trust, Limited.—Interim dividends at the rate of 4½ per cent. per annum on the preference stock, and at the rate of 5 per cent. per annum on the deferred stock, have been declared by the Directors of this Company.

The Use of the Divining-Rod in Searching for Water.—The difficulty of obtaining water on some of the East Yorkshire farms has led to the employment of the divining-rod once more. Mr. Stears, of Hull, who is well known as a "diviner," has been engaged at several places, with singular results. In each case borings have been made, and a good supply of water obtained. Lately Mr. Stears and his rod have been at work on one of Sir Tatton Sykes's farms at Hesterton, Scarborough; and at the place he indicated a bore-hole, with pipes for supplying the farm, is about to be made.

The Recovery of Water-Rates for Small Houses.—In the City of London Court last Wednesday, before Mr. Commissioner Kerr, the case of the *East London Water-Works Company v. Gamble* was heard. The plaintiffs had obtained judgment against the defendant—Mr. Gamble, of 217, High Street, Poplar—for £4 6s. for ten quarters' water-rates due in respect of premises owned by him. He now applied for a new trial. Mr. G. Kebbell, on behalf of the plaintiffs, opposed the application, because there was no defence to the action. He said that the property in respect of which the rates were due was under the value of £20 a year, and therefore the Company were precluded, under the Forrest Fulton Act, from cutting off the supply. They were, therefore, bound to come to the Court from time to time, and proceed against the owner of the houses. Mr. Commissioner Kerr said there was no doubt that the Water Companies had been very badly used owing to that Act. But, for the benefit of poor men like the defendant—he was evidently a poor man, although he held this property—he would insist that in future the Companies should proceed for each quarter as the rate became due. This would, after a very short time, have the effect of preventing the law having to be resorted to, and it would save the accumulation of costs. He granted the application for a new trial.

THE ANNUAL REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACT.

As already announced, the annual report made to the Local Government Board and to the Secretary for Scotland by the Chief Inspector under the Alkali, &c., Works Regulation Act, 1881 (Mr. A. E. Fletcher), was issued early last week as a parliamentary paper. It embraces the work of the Chief Inspector and his staff of assistants during the past twelve months; and, as on previous occasions, we extract therefrom those portions which have most interest for our readers.

The Chief Inspector commences by stating that during 1892 an Act was passed amending the Alkali Act of 1881; and that it was to come into force on the 1st of April in the present year. Attached to the Act is a schedule of 13 additional classes of works which will in future be brought under the provisions of the Act, and thus widen its scope. Among the new works scheduled are those wherein gas tar is distilled, or is heated in any manufacturing process.

Mr. Fletcher reports that during last year the number of registered works in England and Ireland was 910, and 137 in Scotland—differing very slightly from the figures of recent years. In these works, 1225 separate processes were carried on—33 being for the treatment of gas liquor, 359 for the manufacture of sulphate and muriate of ammonia, and 22 for the recovery of sulphur. The work of supervising the various processes devolves on a staff of eight inspectors and sub-inspectors, to each of whom a district is assigned. The number of visits paid to the several works differs according to the nature of the process. Some are carried on day and night throughout the year; while others are intermittent, or proceed during certain seasons only. There were 4506 visits paid, and 4866 tests made last year. The gases over which the District Inspector has control are those only which are discharged into the air during the carrying on of any of the processes specified in the Act or its schedule. A record is kept of the result of every test of such gas or fume; and a monthly report is made of them to the Chief Inspector. In the case of some of the gases, the Act limits the quantity which may be allowed to escape without involving a liability to penalties. In others, however, no limit is fixed; but an obligation is imposed upon the owner of every works to "use the best practicable means for preventing the discharge into the atmosphere of all noxious and offensive gases evolved."

Dealing next with alkali works, Mr. Fletcher states that, since the union of the principal alkali manufacturers into one company, considerable changes have been brought about. A wholesome competition has been established among the managers; and the directors, having the detailed reports before them, have been able to make exact comparison between the different systems of management and working. All that was best in the practical details of manufacture, though found in practice possibly in one of the smaller works, has been adopted in all; and those which were proved, on strict comparison, to be wasteful, have been abandoned. The best of the managers have been promoted to the oversight of districts; and these receive guidance from the central office. Uniformity of method is thus maintained throughout. As an indication of the extent of the soda manufacture under the Leblanc process, Mr. Fletcher gives a table showing the quantity of salt decomposed; this being an index of the whole amount of soda made, whether in the form of ash, crystal, or caustic soda. The salt consumed in the Leblanc soda process in 1890 was 598,684 tons; in 1891, 527,738 tons; in 1892, 479,869 tons. The manufacture of soda by the Leblanc process, which has held its ground for quite a century, has now for several years diminished in extent, owing to the advance of the ammonia-soda process. The quantity produced by each process is shown by the following figures, giving the amount of salt decomposed in the Leblanc and ammonia-soda processes in the United Kingdom in the years named:—

	1892. Tons.	1891. Tons.	1890. Tons.
Leblanc process	519,593	567,863	602,769
Ammonia-soda process	304,897	278,528	252,260
Total	824,490	846,391	855,029

Nevertheless, two large works on the former process were built during last year—one at Irvine, in Scotland, and the other at Felling-on-Tyne. The quantity of soda made by the ammonia-soda process itself is continually on the increase, as shown in the preceding table. This growth will now be still further augmented, as during last year two important works were started, and are already in full operation. One is also in course of erection by the United Alkali Company, near Fleetwood. There will shortly be eight works in operation for carrying on the ammonia-soda process. Efforts are being made in another direction—more in line with the old Leblanc method—to modify the present processes for the production of soda.

Coming to sulphate of ammonia works, Mr. Fletcher remarks that the manufacture of the various salts of ammonia, of which sulphate is the principal, is still vigorously carried on. The increase of this trade iswatched with special interest, because, as has been pointed out on former occasions, the ammonia itself is only obtained as a bye-product in other industries, and has not yet been produced commercially by any direct process. He gives the following statement of the quantity made in the United Kingdom; specifying its principal sources:—

	1892. Tons.	1891. Tons.	1890. Tons.
Gas-works	110,748	107,950	102,138
Iron-works	11,000	6,290	5,064
Shale-works	23,103	26,600	24,730
Coke and carbonizing works	4,973	2,766	2,325
Total	149,826	143,606	134,257

The diminution that will be noticed in the quantity obtained in the shale-works, as compared with that produced in the two previous years, is owing to the slackness experienced in the paraffin trade, in consequence of the increasing importation of foreign oil. From the other sources of ammonia there is a continued increase.

The Chief Inspector next dealt with the Act recently passed to

amend the Act of 1881, so as to bring within its scope certain manufacturing processes which had not hitherto been named in the schedule thereto. Such an extension had, he says, become necessary in consequence of the growth of the chemical trades and the introduction of new processes. The text of the new Act is given, with the schedule containing the additional works placed under inspection. Coming to the clause referring to works for the distillation of gas tar, or where, for other purposes, it is highly heated, Mr. Fletcher remarks that there is a great difference in the existing works. In some, every precaution has been taken to prevent the escape of noxious gases; while in others, but little care has been expended in this direction. He explains that the operation is conducted by means of a large iron still, capable of holding a charge of 10 tons of tar, which is heated by a strong fire underneath it. The volatile portions driven off are condensed in a worm kept cool by immersion in a tank of water. The lighter naphtha first passes over, then follow the heavier oils, until pitch only is left in the still. This is discharged into an intermediate cooler, then into the pitch-bed—a shallow tank large enough to contain the pitch when about a foot in thickness. One chief source of the nuisance from this operation is the worm end, from which issues not only the liquid distillate, but also much that is uncondensable—containing sulphuretted hydrogen and other offensive gases. In the better class of works, this evil is met by trapping the outlet by a bend in the pipe, or by bending it down into a small tank, from the upper portion of which the gas can be led away, while the liquid itself can be drawn off at a lower level. This offensive gas can then, of course, be dealt with by burning in the nearest convenient furnace; care being taken to prevent the communication of fire by the introduction of a water-seal in the course of the gas-pipe, or by so diminishing the pipe at the end near the fire as to prevent the gas firing back. Much nuisance may also be occasioned by the discharge of the hot pitch. One necessary precaution is to have an intermediate vessel, into which it is discharged from the still, and where it may remain until it is sufficiently cooled to be allowed to flow into the pitch-bed without danger of giving off vapour. As, however, the extent of cooling is limited by fear that the pitch might set, and refuse to flow into the bed, it is usually hot enough to throw off some vapour. To confine this, and prevent the nuisance liable to be caused by its escape into the air, the pitch-beds should be enclosed with roof and walls of galvanized iron. The oily vapours, then condensing, return to the pitch, and are a source of benefit to it. Mr. Fletcher points out that there are many minor points in a tar distillery which need careful attention; but in all cases a few simple precautions avail to prevent much of the annoyance that has too often been experienced in their neighbourhood. Not unfrequently the volatile substances thus condensed and arrested will be found to be of some value, and to repay, in a measure, the cost of their collection. A circular-letter was addressed early this year to all tar distillers, in order to draw their attention to the necessity of bringing their works into conformity with the requirements of the Act. The necessity was specially pointed out to them of trapping the ends of the tar-still worms, and leading off the fixed gas to be burnt or otherwise dealt with; also of preventing the escape of gases from the pitch coolers and beds.

In his report to the Secretary for Scotland, Mr. Fletcher makes further reference to the clause in the schedule to the Act relating to works for the distillation of tar, which constitute an important class in Scotland. He says: "Already doubt has arisen as to the interpretation of the clause. The words used are 'gas tar'—meaning the tar produced by the distillation of coal in gas-works. Does this include the tar which is produced by the distillation of shale in paraffin oil works? This tar, though similar, is not identical with gas tar, and, treated by itself, does not give off the noxious sulphur compounds which occur during the distillation of gas tar, for it contains no sulphur. Yet, when distilled, these same gases may occur, because of a previous treatment to which this shale tar has been subjected in some of the works. It is usual in certain cases to mix with it sulphuric acid, in order to separate some of its basic ingredients. This acid, or the remainder of it, decomposed by the tar, when brought to a high temperature, gives off similar sulphurous compounds to those which are so offensive in the case of coal-tar distillation. I cannot refrain from remarking that, if the legislation had been directed to those processes of manufacture from which sulphuretted hydrogen is discharged, instead of to certain processes mentioned individually in which this occurs, this question could not have arisen. Again, if the distillation of gas tar is placed under inspection, still more must tar heating be controlled. Distillation involves the heating of a substance and the subsequent cooling and condensing of the volatile portion driven off by the heat. If in this case nuisance is known to arise from the imperfect arrest of these volatile bodies, still more must that be the case when tar is heated simply with no attempt at the condensation of the gases evolved. Consequently, tar heating was classed with tar distilling. Here again we have proof of the impossibility of correctly scheduling all the processes which should come under inspection. As, in the first instance given, the words 'gas tar' do not include all bodies of the nature of tar, so, on the other hand, the term 'tar heating,' though necessarily introduced, may include too much. It might be held to include a variety of minor operations where tar is gently heated for the purpose of rendering it more liquid, that it may with greater ease be mixed with various ingredients, as in the manufacture of asphalte or the saturation of felt." Mr. Fletcher thinks it is generally considered that the attempt to name all the various processes of chemical manufacture which should be brought under the Act will never be permanently satisfactory, and that a classification based on the naming of the noxious substances liable to be discharged should be resorted to.

In cases where occupations are known to be dangerous or injurious to the workers, provision is made in the Factory and Workshop Act, 1891, whereby such occupations can be brought under its provisions. Accordingly, on the 27th of December last a notice was published in the *London Gazette*, bringing alkali and other chemical works under the provisions of that Act. Special rules are to be framed for the guidance and protection of the men.

As in his previous reports, Mr. Fletcher devotes some space to the subject of black coal smoke; his remarks thereon being as follows: "Although this source of air pollution does not come within the scope of the Alkali Act, its effects are so constantly pressed upon the attention of the inspectors that they cannot ignore it. The damage done to vegetation in the neighbourhood of the chemical works they visit, though often charged on the gases it is their duty to control, is frequently occasioned by the acid of the coal smoke. There are two factors of evil in the smoke—viz., the sulphurous acid arising from the combustion of the sulphur in the coal; and, secondly, the black unburnt carbonaceous matter which carries dirt and sadness throughout the district. No practicable remedy has yet been proposed for the former of these evils. The proposal to wash the smoke by exposing it to the action of a shower of water, or by a dash-wheel in a chamber with water, cannot be considered practicable, seeing that in cooling the gases the draught of the chimney is destroyed, and must be replaced mechanically. The expense of this would be very great, and the cost of the water itself would be excessive; for, unfortunately, sulphurous acid is but sparingly soluble, and therefore large volumes of water would be necessary to ensure efficiency. This problem of combating the smoke nuisance must be carried on, like other struggles, by attacking the weaker part first; and in this case it is the black part of the smoke. Although this portion of the problem is not easy, it is possible of solution; and it has been in many ways successfully attacked as far as the smoke of factories is concerned. In my report for the year 1888, I gave an account of experiments undertaken in this cause. I there detailed the result of the examination of the smoke from 52 furnaces taken in different parts of the country where various kinds of coal were burnt, and in different forms of furnace. The analysis of the gases of combustion showed that there were great differences in the proportions of air admitted, and that in all cases, even where the smoke was blackest, there was an excess of air; that the imperfection of the combustion did not arise from want of air in the fire, but from a misuse of it. It is obvious that, unless the air is mixed with the carbonaceous gases, combustion is impossible, and also unless that mixture is maintained at a sufficiently high temperature. In short, as has been often pointed out, there must be, firstly, a sufficiency of air; secondly, that air must be brought into contact with the fuel, both solid and gaseous; and, thirdly, the mixture of the gases and the air must be maintained for a sufficient time at a temperature of incandescence. These conditions are simple; but the necessity of providing them is not always kept in view. An excess of cold air is often allowed to pass through a gap in the fire or at the end near the bridge, where, passing at once out of range of the heat, it escapes through the flues unused and carrying heat away with it. It is obvious that this must often happen in the case of a hand-fed furnace. The supply of fuel is intermittent, while the supply of air is constant. Clearly, therefore, the necessary proportion between the two cannot be always maintained. The disproportion is also the more aggravated by the bulk of the gases intermittently thrown off. When fresh coal is thrown on a bright and fierce fire, the sudden burst of combustible gases chokes the flue, and in a measure checks the draught—diminishing the supply of air at the very time when it is most needed. This obviously points to the necessity of a constant supply of fuel, which can only be accomplished by mechanical means, unless that fuel is gaseous. Unfortunately, however, many who have adopted mechanical stokers have been compelled to abandon their use, having found that the cost of keeping them in repair has outweighed the advantage expected from them. Elaborate machinery subjected to the rough usage of a stokehole has been found so constantly out of order, that it has been rejected as worthless. Of late years, however, many of these machines have regained their lost character, in that they have been much simplified, their parts better guarded, and their general construction more suited to perform the work required of them. It may with confidence be asserted that consumers of coal in almost all kinds of furnaces have it now in their power to conform to the requirements of the Public Health Act, and prevent the discharge of black smoke from their chimneys. As a proof of this, one prominent instance can be mentioned of a large chemical works where may be seen a row of fifty large Lancashire boilers, each with two furnaces, and an equal number of furnaces applied to other purposes than that of raising steam; making in all as many as two hundred fires. Till lately, a row of four chimneys poured out a mass of black smoke which shrouded the whole district in its pall; now they are smokeless as far as colour is concerned, and only fully-burnt colourless gases are sent into the air. This very large number of mechanical stokers were not adopted until the continued trial of a smaller number proved their efficiency in the prevention of smoke, and the possibility of keeping them in repair at a moderate cost. The question as to the economic use of the coal was narrowly examined; and I am assured that a substantial saving of about 10 per cent. has been effected. This saving, though probably not effected in the quantity of coal consumed, is made in the cost of it, since by automatic feeding the efficiency of a fire may be maintained with a cheaper coal than when hand-firing is relied on. It may certainly be asserted now that it is the prolonged experience of many coal consumers that means are at hand whereby the black smoke of boiler-fires and that of most other furnaces can be wholly prevented, at a moderate cost, or even with profit." During the past year Mr. Fletcher devoted much time to a continuation of these smoke tests; applying them to some of the various systems of firing commonly met with, and a few of the mechanical appliances in frequent use. It was, of course, impossible to test all; and naturally those were chosen where arrangements for carrying out the necessary measurements were most conveniently made. He publishes in his report the results of these analyses of the gases of combustion, being persuaded that similar analyses might with advantage be frequently undertaken by coal consumers themselves, with a view to ascertain the condition of their furnaces as regards the due admission of air and the method of its application. An analysis of the gases of a furnace has often indicated defects which, when thus made known, were easily remedied.

Mr. Fletcher concludes with a few remarks on the air of underground railways. His report is followed, as usual, by those of the District Inspectors, some extracts from which are reserved for a subsequent issue.

EUROPEAN GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held on Monday, the 17th inst., at the London Offices, 11, Austin Friars, E.C.—Mr. J. BLACKET GILL in the chair.

The SECRETARY and GENERAL MANAGER (Mr. W. Williams) read the notice convening the meeting, and also the Directors' report and the accounts. The former was as follows:—

The Company's business has been well maintained during the past financial year; the rental at the seven stations showing an increase in the aggregate, of nearly 1 per cent.

There has been a falling off in the consumption of gas at Boulogne and Nantes, where the competition from the electric light has been felt somewhat severely. But the Directors have reason to hope that the decrease at these stations is but a temporary one; for in other towns—notably Amiens, Rouen, and Havre—they are able to report a considerable increase of business, in spite of similar competition.

In connection with the development of electricity, the Board would remind the shareholders that every effort is made to extend the use of gas for cooking, heating, and motive power; and the Directors are gratified to report, that their endeavours in this direction have been so far successful, that the present consumption of gas during the day represents, on the average, about 25 per cent. of the total rental.

The amount realized by the sale of coke and tar shows a serious reduction, compared with the results of last year; and there seems no immediate prospect of an improvement in the value of these residuals. The price of sulphate of ammonia has not materially altered.

Coals have cost less than during the preceding year; and the Directors have taken advantage of the present low prices to cancel the old contracts, and merge them in new ones at reduced rates—thus assuring the supply of coals for some time on very favourable terms.

The Company have recently concluded an arrangement for lighting the commune of Bléville, a small village adjoining Havre. A treaty has been secured until 1930; and, as the gas will be supplied from the Havre works, the contract will only involve a small outlay for mains.

The net profits for the year admit of the payment of a dividend at the same rate as in previous years—viz., 20s. per share on the fully-paid shares, and 15s. per share on those £7 10s. paid, which the Directors recommend be paid, free of income-tax, on the 1st prox., less the interim dividend of 8s. and 6s. per share respectively paid on the 1st of February last. A balance of £891 will remain to be added to the reserve of undivided profits.

Notice has been given that two Directors (N. E. B. Garey, Esq., and E. F. White, Esq.) and both Auditors (F. J. Roan, Esq., and J Reeson, Esq.) retire from office at this meeting. All, being eligible, offer themselves for re-election.

The CHAIRMAN said that on this occasion, for the first time, they missed the presence of one who had been accustomed to preside over them for many years past, and whose addresses were always listened to with so much interest. Death, alas! had removed from their midst, to their deepest regret, their much-esteemed General Manager and Chairman. The fertility of resource, administrative capacity, and stern devotion to duty, with which Mr. Backler carried on the affairs of the Company, could be only really known perhaps to those who were behind the scenes. More than forty years ago, Mr. Backler joined the Company, which was at that time in very low water; but, by his industry, energy, and ability, he left it, he (the Chairman) thought they might say, second to none of its character in the City of London. So long as the Company existed, Mr. Backler's name would continue to be associated with it. His colleagues mourned the loss of a kind and courteous Chairman; and he was quite sure that, when the Directors sent out the interim dividend and the statement of Mr. Backler's death, they correctly interpreted the proprietors' feelings when they informed them, that they had assured Mrs. Backler how sincerely each of them felt her husband's removal. It might be in the recollection of some of them that, when Mr. Backler, who for many years had suffered from impaired health, last addressed them, he hinted at the time when he would be compelled to give up the active management, and said he thought it possible one who was then sitting by his side might be promoted to the post of General Manager. Upon Mr. Backler's death, the Directors at once met and unanimously appointed Mr. Williams to succeed him. Mr. Williams, he might say, had graduated under Mr. Backler, who had the highest opinion of him; and they might take it that the policy which had been so successfully carried out in the past, would be continued by the Board with the assistance of Mr. Williams. There was one other matter of a personal character to which he must allude. Mr. Backler received a salary as General Manager; but he was only *ex officio* a Director, and he was chosen as Chairman by reason of his special knowledge and long-standing connection with the Company. Upon his death, they could have wished Mr. Garey to succeed Mr. Backler as Chairman. This gentleman had been long associated with Continental gas undertakings, and was in every way well fitted to discharge the duties appertaining to the position. He declined, however, to accept further responsibilities, as did also his other colleagues; and the consequence was that they had been kind enough to elect him (Mr. Gill) to that honourable post. He could assure the proprietors that he undertook the duties with great diffidence, remembering the abilities of his predecessor. He could not hope to lay claim to the administrative capacities of their late friend; but he had been connected with a Metropolitan gas undertaking of some standing for the past twenty years, and he hoped the experience he had thus gained might be of use to him in conducting the affairs of the Company. At all events, he would do his best; and he hoped the proprietors would accord to him their confidence in his endeavour to serve them. Turning to the affairs of the Company during the past year, he said he thought they might congratulate themselves upon the increase of 1 per cent. in the rental. Many of them would perhaps say it was not a large percentage. That might be; but, under all the circumstances, he thought it was satisfactory. During the past year, he had paid a visit to their stations, accompanied by the General Manager. He had not been previously for two years; and he was very much struck at seeing how greatly the electric light had gained ground in the interval. There were very few shops of importance that were not lighted by electricity in the towns the Company supplied with gas, with the exception of Caen. Of course, they must feel this very keenly. The proprietors of the cafés were also users of the electric light. Many people would say that they paid more for electricity than for gas, but that they were compelled to follow suit when their rivals adopted the electric light. All these things considered, it spoke volumes for the industry displayed by their officials abroad, that the Company's rental, instead of exhibiting a falling off, showed a positive increase of 1 per cent. Of course, they had a large day business in the supply of gas for stoves and engines. They had something like 38,000 stoves on hire, besides 250 gas-engines; and the result was that about 25 per cent. of the total consumption of gas was in the daytime. So far, this was a class of business with which electricity could not interfere. That, no doubt, was an advantage; but the gas-stoves affected the coke sales more in France than in England. Many of the French people who used to employ coke for cooking-stoves had taken to burning gas; and, besides, the price obtained for coke during the past year had not been what they could have wished. The depression felt in this country had also been experienced abroad; and the consequence was that the Company had not realized so much as they had hoped from either coke or tar. With sulphate, however, they had done fairly well, and hoped to do better during the current year. Since March 31, the date to which the accounts were made up, he was glad to say there had been a considerable rise in the value of sulphate. The bad debts amounted to only £338, which he regarded as particularly satisfactory, as it showed how well their employees abroad had done their duty. He might state that on the Continent they collected the rental much more frequently than was the custom in this country, with the gratifying result just stated. At all their stations they had shops where they displayed as attractive articles as possible. In the windows there was generally a gas-engine at work, which was sure to attract the attention of the passers-by. He was glad to say that a very good trade had been done at these shops during the past year. In the evening they had them brilliantly illuminated, so brilliantly, in fact, as often to put the electric light to the blush. Within, too, they had an employee who understood his business, and who endeavoured to explain the advantages of gas to people who went in. Altogether, he believed that their shops had paid very well indeed. He had visited them all; and they seemed to be in a flourishing condition. Considering all the circumstances he had mentioned, he hoped the shareholders would agree with him that it was at least satisfactory to have been able to earn their dividend, and to carry forward £900, besides adding £18,937 to their investments. It was absolutely essential that they should maintain this fund, not knowing what might happen to them owing to troubles abroad, and a variety of other things. The proprietors would be pleased to hear that the Directors had succeeded in making their coal contracts for some time to come at a lower figure than previously. He did not think they need be alarmed about strikes. For his part, he did not consider there would be a serious one, because it did not appear that the Durham men were willing to strike. But, whatever might be the case, they were very well protected for some time to come by their stocks. The Company had not suffered during the year from labour troubles of any importance. At Amiens, the workers in the textile district thought they should have shorter hours and more pay; and accordingly they struck work. They intended to go to the Company's works and intimidate their workmen; but the Manager, without loss of time, communicated with the Prefect, who sent 25 soldiers to protect the place. When the General Manager and himself arrived at Amiens, they found the soldiers enjoying themselves on the greensward surrounding the Manager's house. The presence of these few soldiers had an excellent effect; for the strikers no sooner put in an appearance at the works than they executed a strategic movement, which, had the effect of leaving the Company's men unmolested. The latter were perfectly contented with their wages; and only asked, as many men in this country did, to be protected at their work. In France they seemed to possess some happy knack of affording protection, which was so different from the state of things permitted to prevail in this country under similar conditions. When the General Manager and himself reached Nantes, they found the shipbuilders had been disappointed, and had struck for some increase of pay. These strikers also tried to interfere with the Company's men, who asked for a small concession; and the Board, after receiving a report from the local Manager, agreed to grant it. Upon their arrival at Nantes, Mr. Williams and himself were presented by the stokers with two beautiful bouquets. It was a different custom, perhaps, from that prevailing in this country; but it showed the good feeling subsisting between employers and employed, and the act was much appreciated. He did not consider there was anything about which he need further detain the proprietors. If they looked at the Company in any way they pleased, it must be acknowledged to be satisfactory. They had no debenture debt, and a large and increasing business; and he thought they might all congratulate themselves that they were proprietors of the European Gas Company. He concluded by moving—"That the report and statement of accounts now read be received and adopted."

Mr. N. E. B. GAREY seconded the motion; and it was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. GAREY, the dividends recommended in the report were declared.

The retiring Directors—Mr. E. F. White and Mr. N. E. B. Garey—having been re-elected, Messrs. Roan and Reeson were re-appointed Auditors; the remuneration of the latter being increased from 20 to 40 guineas each per annum.

The CHAIRMAN next moved a vote of thanks to the General Manager, to each of the Managers abroad, and to the clerks, who had all well and faithfully served the Company during the past year.

Mr. GAREY seconded the motion; and it was carried by acclamation.

Mr. WILLIAMS briefly acknowledged the vote.

A vote of thanks was then accorded to the Chairman, and the proceedings closed.

Exhibitions of Gas Appliances.—The Davis Gas-Stove Company, Limited, held successful exhibitions last week at Edenbridge and Stourbridge. At the former place they were assisted by Miss Ellen Johnston, and at the latter by Miss E. M. Lucas, both of whom demonstrated to appreciative audiences the culinary capabilities of the appliances shown.

PARÁ GAS COMPANY, LIMITED.

An Ordinary General Meeting of this Company was held last Thursday, at the London Offices, 16, St. Helen's Place, E.C.—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. T. S. Borradaile) having read the notice convening the meeting, the report and accounts, to which reference has already been made in the JOURNAL, were taken as read.

The CHAIRMAN said the shareholders would remember that, at the meeting in January last, Mr. Henry, who was then in the chair, stated that they would be called together at the half year to consider the position of the Company generally. He did not know that it was necessary for him on this occasion to go through the accounts *seriatim*, as there was nothing in them that called for any special comment. If, however, shareholders had any questions to ask concerning them, he should be pleased to answer them. The Board felt that what the shareholders would like to know most of all was their exact position in Pará with reference to the Government. How they stood, to put it roughly, was as follows: Their former contract, which was for thirty years, expired in October, 1892. The Company, in the ordinary course of things, would then have ceased to exist; but it was arranged with Mr. Rumball, who was watching their interests at the time, that the contract should be extended for another year at least. It was further agreed that, on due notice being given, the contract should continue for twelve months beyond the first extension. As a matter of fact, the notice was to be given three months previous to the termination of the extended period, or on July 4 last. No notice, however, was received by that date; and the Board considered that, under these circumstances, they would not be required to go on for another year. A few days afterwards, however, information was sent to the effect that the Government wished them to continue supplying the city with gas for one year more. Of course, he need hardly say that, as a Company, they did not wish to escape any obligation by arguing that the notice they had received was not legally binding, having been given somewhat late. At the same time it was necessary to look seriously into their position, as they were placed in considerable difficulty, not knowing how long they would be required to maintain their existing connection with the Government. Their plant and machinery had, subject to the usual renewals, been in use for thirty years, which was a very good life for a great deal of gas plant. They could hardly be expected, however, to be prepared, at a sudden call, to provide fresh plant themselves, in order to continue the lighting of the City of Pará for the short space of a year. It would entail a ruinous sacrifice if, after doing so, they had to dispose of it at the end of the year. Besides, he apprehended that it would be anything but an easy matter to raise the money under such conditions, unless some very good security indeed were given. When the original contract was extended for a year, Mr. Rumball took care that there should be a promise by the Government that, if it were necessary to lay down new mains and provide fresh lamps, they would be responsible for such expenditure as might be justifiable. If the Company could obtain another such promise from the Government for the further year they were asked to go on, the Board would take into careful consideration the question as to whether or not they should continue. The last time they met, certain tenders for lighting, which the Government had invited, had been sent in; and the Board had hoped to be able to say by this time how things had terminated. None of the tenders, however, had been accepted. The tenders were principally from electric lighting companies; and the Board understood that the electric light was to be supplied in Belem by means of the system of overhead wires, which, to say the least, had been found very inconvenient in the United States. Consequently, if a tender for electric lighting had been accepted, it was doubtful how long it would have given satisfaction to the inhabitants of Belem. If the overhead wire system had not been adopted, then they must have gone in for underground lines, which would have proved exceedingly expensive. When the tenders to which he had referred came to nothing, the Board hoped to be able to negotiate with the Government for the extension of their contract on a more permanent basis than from year to year. On July 7 another advertisement appeared, inviting tenders which were to be sent in by Nov. 1 next. He was sorry to say, therefore, that they were in almost the same position as when they met last January. They were now waiting to see the result of the fresh tenders. He now came to the question of the new contract, the details of which he would not go into, but he could assure the shareholders that they had engaged the serious attention of the Board, who had discussed every point over and over again, to see how they could best meet their present position. He should be pleased to hear the views of the shareholders later on, and to be backed up by them. What the Board felt was this: For many years the Company had worked on under very great disadvantages; and it was some time since the ordinary shareholders received a dividend. They constantly heard from the Directors of the fines which had been levied upon them in a very unjust way. The reason for his speaking of it as unjust was this: Instead of their gas being checked, as it was in every European city, by some impartial system or instrument, which would deal fairly well with both parties to the contract, it was checked entirely by officers going round the streets and deciding that such and such a light was bad, or small, or out altogether. These officers, the shareholders must bear in mind, were the servants of only one party to the contract; and he did not consider it fair that the Company should be mulcted in heavy fines on the representations of such individuals. Without going so far as to say that they were wrong in their reports, he felt that the shareholders would agree with him that, to a certain extent, the men would be guided by what they considered would prove acceptable to their employers. The Board considered, therefore, that the system at present in vogue should be in some way altered. In fact, he should be averse to asking them to embark in any further contract—which he should regard as speculative—if they were to be again subjected to the prevailing system of levying fines. The Government might find that it paid them to impose the fines in the present fashion; but it was hardly fair to the Company to do so. He was sure that modern science, as applied to gas, was equal to the supply of a better and more just check than that to which he had alluded. Of course, a place like Pará differed very much from a European city in its climate. In Pará, besides having lights blown out, they might have the service-pipes, or even the burners, blocked up with insects—a sort of thing which did not occur much in England. A suggestion had been made that the Government might be responsible for the lighting, and the Company for the gas. This was only one of many suggestions; but, whatever course might be finally decided upon, the Directors were most reluctant to again commit the shareholders to embarking their capital in connection with any contract where they would suffer from anything like the present system of levying fines. He had said that they would not be justified in laying out any more money for fresh mains. As justification for this opinion, he might mention that they had been promised a return of certain duties; but they had never had the money. Their Manager was continually trying to obtain it from the Government; and they hoped that eventually they would get it. So far, however, they had been disappointed. The duties in question related to certain plant sent out some time ago, which it was promised should be exempt from any such charge. When the plant arrived, they had to pay duties on it amounting to a sum almost equal to what the plant cost in this country. He did not think there was any other material point upon which he need detain the meeting; but he should be glad if the shareholders would give expression to their views upon this particular subject. They suffered from a great many causes in Pará. Apart from the fines, they were never sure whether the money due to them would be paid monthly; and this created great difficulty in reference to the exchange. As a consequence, it was always hard to foretell exactly how their affairs were going to turn out. On the other hand, he was personally disposed, from what he had read in the newspapers, to take a hopeful view of the future of things in Pará. All they asked from the Government was fair play. As a Company, they were anxious to light Pará in a way that would reflect credit, not only upon themselves, but upon the city also. They felt equal to it—possessing, as they did, a good Manager out there. After inviting questions from those present, he concluded by moving—"That the report and accounts of the Directors to the shareholders, as presented, be and are hereby approved and adopted."

Mr. BLUNDELL, in seconding the motion, asked if it was intended to call up the outstanding £5 on the preference shares; and, if so, at what date. Another thing he wished to know was whether the mains were the Company's property, so that if their contract was not renewed they could take them up and sell them; also what would be the value of their plant as a whole if it had to be disposed of. He said that, like the Chairman, he was decidedly averse to a second edition of the treatment the Company had received from the Government. He thought the sooner they could get rid of their obligations, and pocket what little money they might have returned to them, the better. He was personally obliged to the Chairman for the full and comprehensive manner in which he put their position before the proprietors; and he was sure they all had confidence that, whatever might be the outcome of pending negotiations between the Board and the Brazilian Government, everything possible would be done to conserve the shareholders' interests.

Mr. LAMBERT, referring to the item of repairs in the revenue account, inquired whether the money would be received back from the Government, as it had been spent since the original contract ran out? At the last meeting, a long letter was read by the Secretary which it was proposed to send to the authorities; and he wished to know if any reply to it had been received. The question of the new concession seemed to him to be the most important matter at the present time; and he did not quite gather, from the Chairman's remarks, whether the Board intended to send in a tender. As long as he possessed the gas-works, he personally should not fear the competition from electric lighting. Under the circumstances, he would urge upon the Directors the desirability of getting the authorities to give them what the Chairman called a fair chance; that was to say, that they should be placed in the same position as any other concessionaire. If this were done, he did not fear that they would be able to hold their own.

Mr. CUFF asked if, in the event of the Company not obtaining the renewal of their concession, they would be prevented from continuing to supply gas to private consumers. He thoroughly agreed with a remark which had fallen from Mr. Blundell. It would, in his opinion, be desirable to take some decisive action to bring things to a crisis, in order that they might know whether the Company was to be wound up or not. He believed that, even if a new concession were granted to someone else, it would be very difficult indeed to get the public to find the money to carry it into effect. People had utterly lost confidence in the South American Republics, and would not subscribe capital—just now, at least—for anything in connection with them. He did not therefore entertain any great fears as to any rival company being formed to supply Pará with gas.

The CHAIRMAN, in reply, said that, speaking off-hand, he did not think it likely that they would call up the existing liability on the preference shares. They did not contemplate anything of the kind at present; and as 7 per cent. had to be paid upon the amount called up on those shares, they were not likely to take such a step if it could be avoided. Mr. Blundell had asked a question about the mains and other plant. This was all the property of the Company; and they could dispose of it as they pleased. It was not correct to say that the mains, &c., were thirty years old, as a great deal in the shape of renewals had, from time to time, been done out of revenue. He could not answer the question as to what the value of the Company's plant would be, if it had to be realized. It would be very difficult to do so without a proper valuation being made. Mr. Lambert had asked if they would not be refunded by the Government for repairs. No doubt they would to a certain extent; at least they hoped so, as this was the understanding arrived at with the Government The letter referred to by Mr. Lambert was that the Government should negotiate with them for a renewal of their contract without a tender. No actual reply had been received with respect to it; but advertisements for fresh tenders were issued instead. With regard to the exceedingly difficult question as to whether the Company should

tender, he agreed with Mr. Lambert that it might strengthen their position if they did so; but there were certain legal difficulties in the way. The matter was still engaging the earnest attention of the Board; and everything that had been said on the point should have careful consideration. They, however, did not feel disposed to accept any renewal of their contract unless they were allowed fair play. Mr. Cuff had asked whether, if their contract were not renewed, they would be able to supply private consumers. He did not think they would; but even if they were, the private lights yielded very little profit, more especially as they might have to contend against the electric light. He did not think they would be well advised in precipitating a crisis, as Mr. Cuff suggested they should do. The Board were alive to the position; and if they did not see a chance of obtaining a satisfactory renewal of their contract, they would call the shareholders together, and place the exact state of affairs before them. He might add that there were several other South American gas companies in precisely the same position as their own. The Monte Video, Pernambuco, and Bahia Companies were all working on an extended contract, and hoping to obtain a satisfactory renewal of their original concessions. He was afraid the Company would not be able to get out of their present unsatisfactory position of uncertainty until the tenders which had to be sent in on Nov. 1 next had been decided upon.

Miss PORTMAN advocated that a dividend of 1 per cent. should be declared upon the ordinary shares out of the balance of £5646 shown in the profit and loss account.

The CHAIRMAN replied that this was a matter to be decided by the shareholders; but, considering all things, he thought it would be unwise to pay away in dividends any small amount they might have in hand, especially as at the present time a little money might be essential to the future well-being of the Company.

The motion for the adoption of the report was then carried unanimously.

The CHAIRMAN next moved—"That a dividend at the rate of 7 per cent. per annum (less income-tax) on the £5 per share called up on the preference shares, for the half year ended March 31, 1893, be payable to the shareholders on and after the 1st day of August, 1893."

General TUPPER seconded the motion, and it was carried.

A vote of thanks was accorded to the Chairman and Directors, and the proceedings closed.

THE PROPOSED AMALGAMATION OF WATER-GAS UNDERTAKINGS.

The Scheme agreed to by the British Water-Gas Syndicate.

A Meeting of the shareholders of the British Water-Gas Syndicate Limited, was held in Leeds last Thursday—Mr. SAMSON FOX in the chair—for the purpose of considering the proposal to amalgamate the concern with the North British and the Yorkshire and Lancashire Water-Gas Companies, under the title of the Amalgamated Water-Gas Companies, Limited. The two other Companies interested had already approved of the scheme (see *ante*, p. 36).

The CHAIRMAN, amidst frequent interruption, moved a resolution confirming the agreement for the amalgamation. Alluding to the opposition which had been raised to the scheme at the meetings of the two other Companies, he said those who had raised it might be right; but in questions of this kind, those who had the largest amount at stake should guide the minority, who ought to give way. The proposal for amalgamation, he contended, was one of the best solutions of the question; for it would be better that, instead of the different Companies jarring, they should be combined in one concern, under the same management, and with one set of expenses. The Directors believed there was a future for water gas; they did not know of any case in which it had failed where it had been properly applied. There had been mistakes; but they might profit by them in the future. If he were asked to take a position on the Board of the new Company, he would most willingly do so, for the purpose of giving the concern the benefit of his knowledge; and there were others who would do likewise, if desired by the shareholders. He concluded by explaining that the reason for certain water-gas operations being stopped was not that the Company were beaten, but on account of questions of finance in regard to the sub-Companies.

Mr. PROCTOR seconded the motion.

The CHAIRMAN, in answer to Mr. Leah, stated that the vendors' shares under the new Company would be the subject of agreement with those who held them.

Mr. BROOK said the Directors had had no end of chances of demonstrating what water gas could do, if it could do anything; but it was an utter impossibility. He thought the Chairman should be ashamed to come to the meeting and make the statements he had made.

Mr. BENTLEY prophesied that, in twelve months from the adoption of the amalgamation scheme, the new Company would be in liquidation. He said there was something more than met the eye—there was something behind all this which had never yet been disclosed to them. Why were they told that it was necessary to have the Companies under one management? It meant bankruptcy before very long, in one form or another; and there they had the sole reason, he thought, for the Directors urging them to go in for amalgamation. It meant wiping out the past, and "whitewashing" the Company and the Directors. If the three Companies were voluntarily wound up, they would shut the door to any investigation into the past management and history of the concern.

Mr. WARREN assured the meeting that the last remark was absolutely fallacious.

Mr. LEAH read a statement, in which he declared that most of the material statements made in the prospectus issued to the public were absolutely false. He concluded by moving, as an amendment—"That the resolution moved by Mr. Samson Fox be not confirmed, but a Committee of Investigation is hereby appointed to inquire into the proceedings of the formation and history of this Company, with a view to its being wound up according to law."

Mr. BROOK seconded the amendment.

Mr. WARD remarked that Mr. Bentley had given them the best reason for the amalgamation in stating that the new Company would be in liquidation in twelve months. If this came to pass, the shareholders of the subsidiary Companies would at least save 30s. a share, and the shareholders in the parent Company would save £1 a share.

The CHAIRMAN said he had a complete answer to Mr. Leah's statements, but he would not go into details.

Thereupon the amendment was put to the meeting, and was lost by 16 votes to 5. Then the resolution in favour of amalgamation was submitted—20 voting for it, and 7 against it.

The CHAIRMAN accordingly declared the resolution carried, independently of the proxies.

The meeting then terminated.

THE ELECTRIC LIGHTING QUESTION AT CROYDON.

Mr. Preece's Recommendations Still Unadopted.

The wisdom or otherwise of the Croydon County Council undertaking the supply of electricity in the borough, is a question upon which the opinions of the members are about equally divided. One half are in favour of the Corporation carrying out the work; while the other half consider that, if an installation is required, it should be left to a Company. A few months ago, the Council had before them a report on the subject prepared by Mr. Preece (as noticed in the JOURNAL at the time); but his arguments were not sufficiently convincing to then obtain the adoption of his recommendations. A revised report was submitted at the last monthly meeting of the Council. This had also been prepared by Mr. Preece; and the chief figures, &c., were similar to those contained in the former document. Following Mr. Preece's advice, the General Purposes Committee recommended the Council to carry out the lighting of the compulsory area at a total estimated cost of £25,000, and to make application to the Local Government Board for their sanction to a loan. The adoption of the report was moved by Alderman Miller, who reminded the Council of their past proceedings in connection with this subject, and then went on to speak of what other towns were doing. Since the commencement of the year, he said, 38 sanctions for loans for municipal bodies had been agreed to; the total amount involved being £1,183,824. Speaking on the subject of delay, he said that the Council would find that, if the scheme was not carried out within the next year or two, there would be a large number of private installations, which would take away the revenue. He also referred to the probability of the Brighton Railway Company laying down plant at Norwood Junction for the purpose of supplying East, West, and South Croydon stations. The motion having been seconded, Mr. Howard Martin complained that the report was practically the same as before, excepting that, without one word of explanation, the estimates for lighting had now been increased by some £5000. This showed that either the first estimate was careless, or the second reckless; and what confidence could they have in it? He also criticized the figures in the profit and loss account—particularly the sum of £750 for interest and repayment, which, he maintained, should have been £1300. Where then, he asked, would be the £750 profit towards the reduction of the rates. He moved the adjournment of the debate, to enable the Council to again consider the question of allowing a Company to undertake the work. Alderman Layton, in a vigorous speech, seconded him. He gave some details respecting the experience at Brighton in regard to the estimated cost and the money actually spent on the electric lighting works. The first loan applied for was £32,500; and this amount was very soon spent. Another application was made for £8500. Then £7500 was obtained; and now another £8200 was required to make up ascertained deficiencies. The computations and the amounts really expended for the various portions of the works were as follows: Buildings, estimated at £3000, cost £5059; generating plant, estimated at £8000, cost £10,000; and mains, estimated at £16,900, cost £23,667. He also quoted statistics as to the St. Pancras electric lighting undertaking. There a profit on the work of £2575 was reported; but they did not charge anything for interest, which was £3719, so that the loss was £1149. Several other members took part in the discussion; and on the amendment being put, 21 members voted in its favour, and an equal number against it. The Mayor refusing to give a casting vote, Alderman Miller withdrew the report.

Value of a Water-Pipe Rental.—At St. Helens, last Thursday, Mr. J. B. Leach submitted to public competition an aggregate perpetual yearly sum of £215 9s., payable by the Corporation of Liverpool in respect of a water-pipe rental on a portion of the Rivington pipe-line. The sale excited considerable interest. The bidding commenced at £5000, and went up to £7000, at which the rent-charge was sold; being about 30 years' purchase.

The Water Supply of Temple Newsam.—In the JOURNAL for the 20th ult. (p. 1164), we reported the proceedings at an inquiry held by Major-General Crozier respecting an application made to the Local Government Board by the Rural Sanitary Authority of the Hunslet Union for power to borrow £3500 for carrying out works for the supply of Temple Newsam with water, furnished by the Leeds Corporation. We learn that the Board have given their sanction to the scheme.

The Gas Coal Contracts of the Leeds Corporation.—The Gas Committee of the Leeds Corporation last Thursday had before them the tenders for coal for the ensuing twelve months. They numbered about a hundred; and when they were opened, the quotations showed reductions, compared with last year, varying from 4d. to 3s. a ton. The quantity the Corporation need is 250,000 tons; and the tenders were for from 2000 to 100,000 tons. As the Committee had not had an opportunity of testing the coal of many of the contractors, it was decided to defer accepting contracts for the whole quantity until this week, when another meeting is to be held. It was resolved, however, to give orders for 10,000 tons for immediate delivery. Although the Committee have a stock of coal sufficient to last for two months, it is not thought advisable, especially at the present time, to reduce it.

THE ELECTROLYSIS OF GAS AND WATER PIPES.

The Joint Committee of the two Houses of Parliament who recently had under consideration the question "whether the grant of statutory powers to use electricity ought to be qualified by any prohibition or restriction as to earth return circuits, or by any provisions as to leakage, induction, or similar matters, and, if so, in what cases and under what conditions," have made their report. It will be remembered that one portion of the Committee's investigation bore upon the effect of electrolysis upon gas and water pipes; and their proceedings, as far as this subject was concerned, were reported in the JOURNAL for the 4th inst. (p. 38). The Committee have agreed to a clause which, subject to modifications to meet particular cases, they recommend for insertion in all Bills and Orders authorizing the use of "large electric currents for other than electric lighting purposes." The following is the substance of the clause: In the use of electric power, the undertakers are to employ either insulated returns or uninsulated metallic returns of low resistance; and they are to take all reasonable precautions, in constructing, placing, and maintaining their electric lines and circuits, and other works of all descriptions, and in carrying on their undertaking, so as not to injuriously affect, by fusion or electrolytic action, any gas or water pipes, or other metallic pipes, structures, or substances. The exercise of the powers conferred upon the undertakers is to be subject to the regulations and orders of the Board of Trade; and for every breach thereof they are to be liable to a penalty not exceeding £10, and to a further penalty not exceeding £5 per day in the case of a continuing offence. The Board of Trade are to have authority to order the undertakers to cease to use electric power. Disputes between the undertakers and other parties are to be settled by the Board of Trade, or by an arbitrator to be appointed by them. Nothing in the proposed clause is to apply to the use of any electric line, circuit, or work of any company, corporation, or person authorized by any Act or Provisional Order to supply energy for electric lighting, so far as such use is limited to this purpose. The Committee agreed to a number of resolutions in the nature of recommendations, in the course of which they stated that, having regard to the evidence before them, they are of opinion that it is not, in the present state of electrical science, to the interest of the public to insist upon electrical tramways using an insulated return conductor; and that such insistance would retard the development of electric traction. The chief objections urged before them to an uninsulated return conductor were the interference, by leakage and induction, with telephones and railway signals, and the damage to systems of gas and water pipes by the action of leakage currents. The Committee consider that the danger of fusion or electrolytic action has arisen from a faulty system of constructing electric tramways; and they express the opinion that it can be so reduced by improved methods of construction as to be practically negligible. The Committee recommend the Board of Trade to make regulations embodying the following provisions: (1) That a return conductor, if in contact with the ground, shall be of such section and resistance as to have no difference of potential sufficient to set up injurious leakage currents in the earth. (2) That, both with regard to the structure of the line and to the method of generation and use of the electrical current, everything shall be maintained up to the standard required by the Board of Trade; but if the regulations are altered after the use of electric power on the line has been sanctioned, the undertakers shall not be required to alter the structure or method of working of the line to conform to the more recent regulations, except for the public safety, or unless it shall be proved to the satisfaction of the Board that any system of metallic pipes or structures is being injured by the action of electricity escaping from the conductors, or for purposes other than public safety or injury to pipes or structures which the Board may think right, provided that the alterations do not in such last case cause substantial additional expenditure. (3) That all such electrical tests shall be applied to the line by the undertakers as the Board of Trade may think necessary, and that a record of these tests shall be kept for the information of the Board. (4) That the Board of Trade shall have all reasonable facilities for making any tests they may think necessary, in addition to those recorded by the undertakers, to enable them to ensure the maintenance of satisfactory conditions. The Committee regard with apprehension a large extension of the system of overhead wires in crowded centres. In conclusion, the Committee express the opinion that undertakers proposing to employ large currents should be required to give ample notice to those using small currents, to enable them to protect themselves by insulation; and that with this view, and in reference to the clause agreed upon, a period of two years may fairly be allowed to telephone and telegraph companies from the date of the passing of any Act or Order.

THE EARLY HISTORY OF WROUGHT-IRON GAS-PIPE.

A short time ago, a paper on the above subject was read by Mr. R. T. CRANE before the Steam-Fitters' Convention at Chicago.

The author began by stating that the demand for wrought-iron pipe began with the discovery of illuminating gas; but the introduction of this lighting agent was at first very slow, in consequence of prejudice and want of appreciation of its importance. About this time—the latter part of the seventeenth century—the long war between England and France was drawing to a close. It had made a great demand for gun-barrels, which were largely made at Wednesbury; and at its close it left a large quantity of this stock on the market, which (there being no other demand for it) was used for the small gas-tubes by screwing the smaller end of one tube into the large end of another. The supply apparently covered the demand for small tubes for some time, and the larger ones were made in the same manner.

In order to understand the invention of gas-tube welding, it is necessary to describe the welding of gun-barrels. This consists in taking a properly prepared piece of iron of the right dimensions, drawing the edge down thin, heating it, and then rounding it up until the edges lap one over another. In this form it is heated in a forge fire, a few inches at a time. Then a bar of iron is put on the inside, to give support to the iron while it is being hammered down on the outside and the weld made. Only a few inches could be welded at each heating of the iron—making the process a very slow one; and the barrel, when the welding was completed, was left in a rough and unfinished state.

About the year 1825, in order to meet the largely increased demand for gas-tubing, it became evident that some better mode of manufacturing it should be sought for than the process of welding gun barrels. James Russell, in company with his brother John (who had been gun-barrel and gas-tube makers at Church Hill since 1811), appreciating this fact, set about making an improved gas-tube. He concluded that it should be of a uniform thickness of iron, and also, as the pressure of gas was merely nominal, that there was no necessity for so strong a weld as that of the gun-barrel. He conceived the idea, and patented it, of welding his tube by butting the edges of the iron together instead of lapping, as in the case of the gun-barrel. This invention was a great step in advance of this art, and enabled him to make his tubes much more cheaply and rapidly, also of vastly superior finish. Still, compared with a later process, a description of which will follow, this production was very slow, as he was obliged to heat it only a few inches at a time, after the manner of welding gun-barrels.

To make the gas-tubing complete, it was necessary to have a device for connecting pieces of pipe, as the method employed with gun-barrels was not practical in this case—the iron being of uniform thickness. He now invented the socket; and the effect of the improved process was to so cheapen and beautify the article as to greatly increase the demand for it. But this particular method of manufacture must have been very short-lived (it being patented in January, 1825), since it was followed by the patent of Cornelius Whitehouse in February of the same year for butt-welding tubes by drawing them through a die. This system being brought to the attention of Mr. James Russell, he saw its importance, bought it, and immediately proceeded to manufacture his tubes under this patent. Mr. Russell recognized the principle of the strength of a circle—that is, when the iron for a tube is rounded up, any amount of pressure may be brought to bear on the outside without danger of the iron collapsing. This pressure was necessary to force the edges of the iron together in making the weld. His process of doing this was to heat a small piece of the iron, then place it between two semicircular dies smaller than the iron, which necessarily forced the edges together, thus making the weld.

To return to the Whitehouse patent, and to make clear the principles involved in it, it may be stated that he took such dies as Mr. Russell used, made one end of each bell shaped, and fitted them in a pair of tongs. He then took a piece of the rounded-up iron, called "skelp," and put about half its length in the furnace; heating it to a welding heat. The die was then pressed on the iron; and by an endless chain the iron was pulled through the die. The die being smaller than the iron crowded the edges together and made the weld.

The principle involved in the Whitehouse method consists in the manner of applying the pressure to produce the weld. Mr. Whitehouse did this by drawing the iron through the die; and Mr. Russell by compressing the dies. So, to give proper credit for these advances in the art, it should be said that Mr. Russell is entitled to the credit of discovering that a tube with a butt-weld is sufficiently strong to stand all ordinary pressure, and that a sufficient pressure can be brought to bear upon the circle of the iron to produce the weld. Mr. Whitehouse is entitled to the credit of finding out that the pressure to produce the weld can be obtained by drawing it through the die, which is simply an improvement upon the principle Mr. Russell discovered; yet it was an invention of very great importance, as it enabled him to make tubes a hundredfold more rapidly, and also of a superior weld and of much greater length. Strange to say, this process has never been improved upon, and is the one in universal use for the manufacture of the small tubes at the present time. The result of the Russell and Whitehouse improvements is the production of an article of great utility and beauty at an exceedingly low cost. As an evidence of the importance of the advanced process of Russell and Whitehouse, it may be stated that they paid as much for welding the gas-tubes under the gun-barrel principle as the finished, vastly superior product is being sold for to-day.

The above-mentioned events took place in the early days of gas-engineering; and, while steam engineering was also being developed, it had not, up to this time, reached any great degree of magnitude. But now its importance began to be more particularly recognized in connection with the building of railroads and locomotives, and through the discovery by Stephenson of the tubular boiler. This created a demand for a larger and different line of tubes, for which the butt-weld was not adapted, as the tubes were required to be much larger and stronger in the weld. It was evident that the only way to produce an iron tube suitable for these demands was to make it with the lap-weld, as in the case of the gun-barrel; and, while it would have been possible to make lap-weld tubes of uniform thickness and moderate length by the methods employed in gun-barrel making, it is evident that the process would have been too slow and expensive in operation, and the product too limited in length to meet the demands of steam engineering.

At this time—which must have been about 1830 or 1835—Messrs. Russell appeared to have appreciated the importance of manufacturing a new line of tubing, and set about making the machinery necessary for it. To accomplish this was quite a different task from that of producing the butt-weld tubing, as it called for the highest order of mechanical skill and ingenuity, and there is no doubt that it cost Messrs. Russell a large amount of money in experimenting before they perfected their machinery. They must have met with untold difficulties and annoyances in perfecting the machinery and furnaces, which only persons who have gone through similar ordeals, though having the benefit of their experience to commence with, can appreciate. They were certainly men possessing extraordinary courage and perseverance to contend successfully with apparently insurmountable difficulties.

About this time, or a little later, Martin Jones commenced experimenting on the same line. He also encountered many difficulties—exhausting his own and his wife's fortune; and in order to save something from the wreck, he placed his invention in the hands of a

friend, who appropriated it to his own use, improved it by continued experiments, and patented it in his own name. The difference between the Jones and Russell processes appears to be only that Jones made use of four rolls in the welding machinery and Russell only two. The firm who were working the Jones idea brought an action against Messrs. Russell for infringement of their patent; but it resulted in victory for the latter.

The process of lap-welding is as follows: The sheet of iron is rolled to the desired thickness, width, and length. The edges are then scarfed, as in the case of the gun-barrel. It is drawn, while red hot, through a bell-shaped die, by means of an endless chain, which rounds it up and laps one edge over the other. The whole length is put in the furnace and heated to the welding heat, and afterwards pushed out at the opposite end into grooved rolls of a size corresponding to the size of the pipe. The inside lap is supported by a ball attached to a long bar of iron, which holds the ball in position in the roll. The ball, the iron, and the groove of the roll all correspond; so that the roll exerts a sufficient pressure upon the iron and the ball to force the laps of the iron firmly together, producing the weld. The entire process must be perfect in order to ensure success. After the process of welding, the crude piece of pipe is passed through other rolls to give it the correct diameter; and again through others to straighten it. The tubes are subsequently tested, and are then ready for the market.

Probably the production of no other line of goods ever created such a sensation as this; and never were manufacturers so harrassed by pirates in the trade as were the Russells. It is a satisfaction to know that they combated all opposition, and maintained their patent, and that finally success crowned their enterprise, invention, skill, and perseverance.

SULPHATE OF AMMONIA AS A MANURE.

[From the *Chemical Trades Journal*.]

In a monograph on the use of nitrogenous manures, read at the conference of the Old Students' Association, Gembloux, the following particulars concerning sulphate of ammonia are given:—

Sources.—Gas-works, sewage, distillation of organic materials, condensation of the nitrogen from products of combustion, distillation of schists, &c.

Conditions of Sale.—The price of the nitrogen of nitrate of soda should be compared with that of the nitrogen of the ammonium salt.

Adulterations.—Common salt, kainit, ferrous sulphate, &c.

Behaviour in the Soil.—It decomposes more or less rapidly in contact with the carbonates of the soil (carbonates of lime), and is converted into ammonium carbonate. This combines with the clay and the humus, forming insoluble compounds; and this prevents the spontaneous dissemination of the fertilizer throughout the soil. Ammonium carbonate is volatile, and may escape into the air when the decomposition of the sulphate is too rapid (calcareous or recently limed soils), or when it is formed at the surface of a soil which is too dry and poor in humus and clay. When a soil presents favourable conditions of aëration, moisture, and temperature, the nitrification of the ammoniacal nitrogen takes place rapidly. It usually requires about a fortnight or three weeks (Muntz and Girard, Schlœsing). The nitrate formed, chiefly nitrate of lime, dissolves, spreads throughout the soil, and can then be removed by water just in the same manner as nitrate of soda. Statements to the effect that the ammoniacal nitrogen, being fixed by the soil, could not be lost in this way, are therefore erroneous. The annual loss by drainage is nevertheless a little lower than that of nitrate of soda. Nitrogen being absorbed most freely by the roots in the form of nitrate, it follows that sulphate of ammonia cannot act so quickly as nitrate of soda; notwithstanding this, it is a rapid fertilizer as compared with other nitrogenous manures. Sulphate of ammonia also produces certain secondary effects. Prepared from about 60 per cent. of its weight of sulphuric acid, the latter is transformed, during the decomposition, into sulphate of lime or plaster of Paris. This substance appears to act as a stimulant to the nitrification of nitrogenous materials. Carbonate of ammonia combines with the clay as soon as it is formed; and this clay contains among its constituents a certain amount of potash, which is not easily attacked by the ordinary solvents. The ammonia replaces the potash, and thus renders it available for assimilation. Sulphate of ammonia sometimes produces injurious effects upon plants, shown by the development of a yellow colour and a drooping appearance. This is no doubt due to the causticity of the carbonate of ammonia which is formed (this action is sometimes produced with fresh manure). Finally, when the sulphate is badly spread, and comes into contact with the seeds, it may injure their germination.

General Principles for the Use of Sulphate of Ammonia.—From what has been stated, it follows that sulphate of ammonia is not suitable for calcareous soils, nor for land in which the nitrification is hindered by the soil being too compact, too moist, or too acid. To decide upon the time at which to apply the sulphate, it is necessary to consider the period which it requires for nitrification. Applied at the time at which vegetation is commencing to develop, no effect will be produced until after the lapse of the requisite number of days, varying according to the more or less favourable conditions of the soil and the activity of the microbes. Concerning the dissemination of the sulphate in the soil, it is to be observed: (1) That it may be treated in the same way as nitrate of soda, except that it must not be mixed with basic phosphate or lime; (2) that simple spreading on the surface of the soil is not sufficient to ensure the dissemination of the sulphate in the arable layer. The nitrogen may continue for a long period in the ammoniacal condition in the surface layers during dry weather, and may even escape into the air. It is also under these circumstances that the injurious effects on plants are produced.

It follows, from what has been stated, that the manure should always be well worked in. Its use as a top dressing, without subsequent harrowing and second dressing, should be strongly discountenanced. The nitrogen of sulphate of ammonia, like that of all manures which readily undergo nitrification, being liable to be washed away by drainage water, compels the application of more than the necessary amount, and prevents its being applied too long in advance. Experiments made at Rothamsted prove that the plan of applying in the autumn, which is advised by some, necessitates considerable losses. In general, it should be applied in the spring, a little sooner than nitrate of soda, on ground containing the winter-sown crops, and a few days before the spring sowing or planting. In this way it will exert its action at a useful time, and the injurious effects are guarded against. In any case, leguminous seeds, being very sensitive to the caustic action of sulphate of ammonia, sulphate should not be used as a top dressing for cereals on which it is intended to sow clover. Heavy rains following the application of this fertilizer do not have the same bad effect as in the case of nitrate of soda. On the other hand, the sulphate is less adapted for stimulating growth after the frosts of a cold spring or for rapidly imparting vigour to plants attacked by insects. The very contradictory results obtained in experiments having for their object the comparison of the agricultural value of sulphate of ammonia and nitrate of soda, are, we believe, largely due to the fact that the principles which must be observed in the use of the sulphate have been to a great extent overlooked. Moreover, the secondary effects which may be produced by manures have to some degree been lost sight of.

THE LEEDS WATER-WORKS.

On Monday last week, the members of the Leeds Corporation paid their annual visit to the water-works, under the guidance of the Chairman of the Water Committee (Mr. A. Cooke). The excursion ended at Ilkley, where the party dined together at the Crescent Hotel. In reply to the toast of "The Leeds Water-Works," which was proposed by the Mayor (Mr. Alderman Ward), Mr. Cooke gave some particulars in regard to the undertaking over which he presides. He stated that no less than 6674 new supplies had been laid on during the past year; and consequently the responsible duty of the Water Committee to maintain efficiently the old and new supplies, in the face of the recent extraordinary drought, had been both arduous and anxious. The annual average rainfall in the Washburn Valley was 34 inches; but the past six months had registered only 11 inches—not quite one-third of the average. Up to date, no diminution of the supply had been necessary; but the fact remained that the present stock of water was but 43¼ days' supply, as compared with 115 days' supply in the corresponding week of 1892. The Committee had laboured under double disadvantages—first, by absence of rainfall; and, secondly, by increased demand created by the hot, dry weather, which amounted to 15¼ million gallons per day, as compared with the ordinary consumption of 13½ million gallons. Contrasting the position of the inhabitants of Leeds with those of Manchester, who had to submit to a curtailed supply, Mr. Cooke said the Committee were assured that, if a reasonable degree of economy were exercised, a saving of quite 2 million gallons of water per day could be effected, and without inconvenience to anyone. The Committee had no wish or present intention to limit or restrict the hours of supply, and would not do so unless absolutely "cornered." With respect to the Eccup trench, he stated that a sound water-tight bottom had been obtained by deepening the trench from 30 to 70 feet. The puddle wall had now been replaced to a depth of 100 feet. The work was rapidly and very satisfactorily progressing under the contractor, Mr. Gould. Some 80 feet yet remained to be filled in. Under the advice of the City Engineer (Mr. T. Hewson), confirmed by Mr. Hill, of Manchester, the Committee had decided to strengthen and deepen the remainder of the embankment, and extend the puddle wall on the same water-tight base. This work had been commenced, and would be pushed forward with all speed compatible with sound and good work. The Blackmoor Tunnel was practically completed, and lined throughout with excellent brickwork laid in cement. The Moortown reservoir had been enlarged during the year to double its former capacity—viz., from 680,000 to 1,360,000 gallons—and had proved of invaluable benefit. The Committee had laid 15 miles of new mains, chiefly for the supply of new properties, and also for affording an improved service to districts which had outgrown the capacity of the old mains. Despite the manifest depression in several important industries, the fact remained that the sale of water by meter for manufacturing purposes in Leeds showed an increase of 38 million gallons. Coming to the financial position of the undertaking, Mr. Cooke stated that the amount of the capital account was £1,697,000; that already paid in reduction of capital account, £105,286; and that invested on sinking fund account in corporate bonds, mortgages, and other solid securities, &c., to be ultimately used in redemption of capital account, £134,382. The trading account was as follows: Total revenue from all sources for the year 1893, £102,828; do. for 1892, £101,350—increase of income over 1892, £1478. The working expenses for the year amounted to £21,651, which sum, deducted from the revenue of £102,828, left a gross profit balance of £81,177, out of which interest on loans had been paid amounting to £58,366—leaving a surplus of £22,811. From this surplus the sum of £16,460 had been set apart towards the reduction of the debt—leaving a clear net balance of profit of £6351. He concluded by acknowledging the useful assistance he had received from all the head officials—the City Engineer, the Resident Engineer (Mr. G. Hewson), and the Superintendent (Mr. G. Wood). The Water Committee, he said, were fully cognizant of their responsibility to maintain a full and continuous supply of pure water for the 420,000 items of humanity within and beyond the city; and they trusted to receive from their brethren in the Corporation, not unkind criticism, but that kindly advice and help so very necessary to conduct their vitally important undertaking to a wise, successful, and profitable issue.

The New Gasholder at Salisbury.—Messrs. E. Cockey and Sons, of Frome, have just secured the contract for the erection of a two-lift gasholder and cast-iron tank at the Salisbury Gas-Works. Each lift will be 24 feet high—the inner one 101 ft. 6 in., and the outer 103 ft. 3 in. in diameter. The tank will be 105 feet in diameter; and, on account of the nature of the soil, which does not admit of excavating to any advantage, it will be almost entirely above ground.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Through the kindness of Mr. R. S. Carlow, I have received intimation of the arrangements for the meeting of the North British Association of Gas Managers at Dundee next week. I find that my preliminary announcement of a fortnight ago did not contain all that could be told; and, like the writer of your leading article last Tuesday, I am disposed to feel surprised at both the richness and the extent of the business programme. My fear is that, with six papers to read and five discussions to take place, there will not be time in one day to do justice to them all. The President, I presume, will require to exercise a firm hand upon the discussions, and to "closure" them whenever he sees the least tendency on the part of the speakers to wander. There will be six or six-and-a-half hours in which to do the work; and with promptitude and good management, there should be sufficient time—whether or not all who would like to speak get the opportunity—in which to express as much as should provide food for reflection during the ensuing twelve months. The communications and discussions on oil enriching should be particularly helpful to members of the Association, most of whom are connected with small gas-works, to which the Peebles system is specially adaptable. Mr. Nelson's paper on the Yeadon process will appeal more to those connected with large works. These two subjects would in themselves have proved sufficient for the meeting; but the other three are all of importance at the present time, and the Committee could not afford to dispense with them when they had the offers of the communications. It will be observed that the programme contains no reference to the other great branch of gas enrichment—the carburetting of water gas—in which Professor Lewes has recently made a distinct step in advance. In leaving it out, the Committee have acted wisely, unless Professor Lewes had come himself to explain it; because, the process being only in an experimental stage, is not well understood by the members, and a discussion upon it would not be profitable. There is no doubt, however, that it will be brought up either in Mr. Young's or Mr. Bell's paper, if for no other reason than that it will be necessary for them to take notice of Professor Lewes's remarks at Belfast upon their invention. At the same time, the subject will not technically be before the meeting; and in my opinion, if discussion be allowed upon it, it will be both out of order and a waste of time.

The Paisley Corporation Gas Department continues to show a record of advance. For the past year, the revenue of the department was £37,722, of which £32,836 was derived from the sale of gas, £3221 from tar and ammoniacal liquor, and £1191 from coke (sold and unsold). The ordinary expenditure was £29,227. This would have left a surplus of £8495; but during the year the Corporation expended out of revenue £3486 on new coal-stores, and £1003 on the laying of 5472 yards of main and service pipes, which reduced the surplus to about £4004. A year ago the surplus was reported to be £3930, the whole of which was "grabbed" by the Municipality for town improvements. Even after voting that sum away, there was at the credit of the profit and loss account, derived from previous years, a sum of £9725, which, with the £4004 of this year, raised the fund to £13,729. Charges for interest, &c., amounted to £2766—a wonderfully low charge; but this is explained by the fact that, of the original annuity stock of £40,000, only £12 10s. remains to be redeemed. A sum of £500 is added to the sinking fund, raising the total charge to £3266, and leaving a net surplus for the year of £738. Out of this sum, the Corporation have resolved to place another £500 to the sinking fund, and to carry forward the balance of £238 to the profit and loss account, which will now amount to £9963. There is thus, unless the Corporation lay ruthless hands upon this standing balance, nothing left for them this year to seize for town improvements; and whether they will take any part of it or not, there is as yet no indication. As compared with the previous year, the revenue was £1500 less, notwithstanding that the price of gas was continued at the same figure—2s. 10d. per 1000 cubic feet—and that the sale of gas increased from 235 to 237⅓ million cubic feet. But this decline is doubtless to be accounted for by the fall in the price of residuals. It is also noticeable that unaccounted-for gas is as high as 12·78 per cent., which is probably to be attributed to the operations connected with main-laying. Taken all over, the results are such as could only have been attained by careful and capable management, and husbanding of materials—work which Mr. G. R. Hislop, the Manager, finds his element in, and for which he this year deserves the highest credit. At the annual meeting of the Corporation on Thursday, it was stated that they had purchased coal for the current year at 2s. 4d. per ton less than last year; and this, with other savings, enabled them to reduce the price of gas to 2s. 8d. per 1000 cubic feet, and to estimate for a surplus at the end of the year of £4000. It is proposed to abolish meter-rents, which the Corporation can well afford to do, the revenue on that head having only been £859.

The Greenock Gas Trust have, for a place where the practice of "milking" gas profits by the municipality goes on, concluded what to me is an ideal year, in that they have been able to square up their accounts with only a surplus of £57. The revenue was £38,985, of which £33,719 was realized from the sale of gas, and £5126 from residuals. The gross profit was £8119; but out of this there required to be paid £4959 for interest, £3000 to the sinking fund, and an extraordinary payment of £103 for meters, which the Corporation provide free. The output of gas was 222½ million cubic feet, or 7½ million cubic feet less than last year. But it was then 19 millions higher than the year before; so that compared with two years ago there is an increased output of gas of 11½ million cubic feet. The loan account amounts to £101,796; the contingent fund, to £1968; the sinking fund, to £46,437; and the fund for redemption of mortgages, to £9400. The property account amounts to £138,800; and the value of the new gasholder is £6349. There are thus abundant assets to place the Corporation on a sound financial basis. While that is so, it is with disappointment that I learn the Police Board are to take £700 from the contingent fund for their general purposes account. The only gleam of satisfaction there is in that direction, is that the contingent fund cannot stand these yearly drains long; and if the Gas Trust could manage to finance their undertaking as they did last year, they might be able to stop the evil practice of making the gas consumers pay for what the ratepayers should. The price of gas has been 3s. 4d. per 1000 cubic feet since 1890; and it is to be continued at this rate. The quality of the gas last year was 25·87 candles. The Manager, Mr. S. Stewart, rightly holds a foremost place among Scotch managers. The wonder is that, working amid the discouragements he has to encounter, he should do so; but perhaps with him adversity only serves to whet his energy.

The Ayr Gas Company (of which Mr. W. Smith is Manager) have paid a dividend at the rate of 6 per cent.—the same as last year. Their revenue was £10,567; and the net balance, £2510. The capital stands at £36,000; and the reserve fund, to which £400 is added yearly, amounts to £2400. In that respect, the Company is heavily weighted—the capital charges and reserve fund amounting to about 1s. 3d. per 1000 cubic feet. Otherwise, the Company is satisfactorily situated, as is shown by the fact that the cost of works has been kept square with the liabilities, and now stands at £35,402, while stocks on hand and outstanding debts amount to other £967. During the year £775 was expended upon repairs, maintenance, and renewals; and the Chairman at the annual meeting was able to assure the shareholders that the works were in efficient order. The Directors had had under consideration a proposal to introduce the Peebles process of oil enrichment; but they had resolved to delay the subject till further experience should be gained with it. The Barrhead Gas Company, which is managed by Mr. J. W. Carmichael, has paid a dividend at the rate of 7½ per cent. for the past year. The shareholders remitted to the Directors, with powers, to consider the subject of hiring out cooking-stoves; the charge for gas for that purpose to be 3s. 6d. per 1000 cubic feet. The price of gas to ordinary consumers was reduced by 2½d., making it nominally 4s. 2d. per 1000 cubic feet; but with discounts, the average price will be 3s. 8¾d. per 1000 feet. The recently reconstructed Cupar Gas Company have paid a dividend at the rate of 7 per cent., and carried upwards of £100 forward. The Company are making alterations on their works, the result of which, the Chairman stated, would be that the gas extracted from the coal would be greatly in excess of that produced by the present system. The Irvine Gas Company, upon a capital of £8718, earned a profit of £1106. A dividend at the rate of 10 per cent. was declared; and it was resolved to reduce the price of gas from 4s. 2d. to 3s. 9d. per 1000 cubic feet. The Company possess a reserve fund amounting to £2661; but they expect this will be nearly exhausted, in connection with a new gasholder which is being erected. Mr. A. MacPherson, of Kirkcaldy, is in the happy position of being able to show, year by year, a steady increase in the output of gas from the Company's works. Two years ago, it rose from 64 to 70 million cubic feet; last year it was stated to have risen to 72,740,000 cubic feet; and this year, a further increase is reported of 2,645,000 cubic feet. Twelve months ago the price of gas was retained at 3s. 6½d. per 1000 cubic feet; and the revenue during the year was £3640, as compared with £3180 in the preceding year. This increase, the Chairman at the annual meeting of shareholders stated, was in excess of what they anticipated. They were able, he said, to reduce the price of gas from 3s. 6½d. to 3s. 1½d. per 1000 cubic feet, on account of the fall in the price of coal, and of the excellent way in which their works and business had been managed by Mr. MacPherson. That this was a well-deserved compliment everyone will admit who knows the way Mr. MacPherson does his work. The Company declared the usual dividend of 7s. 6d. per share, added £500 to the depreciation fund, and carried forward £384. The Kirriemuir Gas Company have paid a dividend at the rate of 5 per cent., and have reduced the price of gas from 6s. 3d. to 5s. 10d. per 1000 cubic feet.

The Laurencekirk Gas Company have paid a dividend at the rate of 5 per cent. The Manager, it was stated, had been trying the new system of making gas with oil; and he submitted a report on the subject, with which the meeting were so pleased that they authorized him to continue his experiments. The Leslie Gas Company have paid a dividend at the rate of 6½ per cent. for last year, as compared with 7½ per cent. for the preceding year. It has been decided to reduce the price of gas at Tayport by 5d. per 1000 cubic feet, making it 6s. 3d. The Montrose Gas Company, which is managed by Mr. T. Douglas Hall, President of the North British Association of Gas Managers, increased their sales of gas last year from 21,000,000 to 21,123,900 cubic feet; but on account of the high price of coal and the low returns realized for residuals, the profits fell from £1376 to £1107. The Chairman, at the annual meeting of shareholders, explained that the expenditure was £4816, as compared with £4868 in the previous year; and that coal cost £3068, as against £3129 in 1892, £2680 in 1891, and £2390 in 1890. On the other hand, residuals, which in 1891 realized £437, only brought in £197. The price obtained for residuals last year was 1s. 7d.; but this year they had contracted to sell them at 1s. 10d., which would bring in £30 or £40 more upon this head. On account of the diminished profit, the dividend was at the rate of £2 10s. per share, instead of £3 as usual; but the Chairman thought they might expect, considering that coal would cost them £300 or £400 less this year, that the higher dividend would perhaps be restored next year.

At Denny, the profit upon the sale of gas last year was only £2 3s. 9d., upon an income of £1870. The Commissioners expressed themselves as gratified that they did not encounter loss upon the year's working, on account of the high price of coal and the low price for bye-products. They are about to reconstruct the retort-bench upon Mr. G. R. Hislop's regenerative system. The Johnstone Gas Commissioners have not had a year which they will consider satisfactory. Although their accounts show a gross profit of £3291, the charges for interest and for coal were so high that on the year's working there was a loss of £223. The loss, it was explained, arose chiefly in connection with the introduction of new retorts and the repairing of mains. The price of gas was not raised. The Kirkcudbright Gas Commission earned a profit last year of £59, which the Commissioners thought was so satisfactory that they advanced the salary of the Manager of their works by £10. As they are about to procure a washer for the works, and wish to have a little money in the bank to meet emergencies, they resolved not to reduce the price of gas this year. The Tain Gas Commissioners earned a profit on the year's working of £124. The Commissioners are only newly in existence; and they had to spend large

sums in reconstructing the works. Their capital account now amounts to £4044, of which £2500 was received on mortgage in June last. At Wishaw, the accounts of the Gas Commissioners showed a balance of profit at the end of the year of £730. The income was £4294. The total loan now on the works amounts to £15,450.

The problem of how some gas-works are more successful than others which are similarly situated as regards consumption and contiguity to markets, is one which has puzzled longer heads than mine; and I need not enter into it here, but merely note the fact that the Berwick and Tweedmouth Gas Company is one of the best conducted gas undertakings that I know of. They regularly pay a dividend at the rate of 10 per cent., and have paid that sum this year. What is better, during all the time of the high price of coal, the charge for gas has never been raised, but has on more than one occasion been lowered. This year it has been reduced from 4s. 5d. to 4s. 1d. per 1000 cubic feet; and since Mr. A. B. Walker became Manager, now 5½ years ago, the reductions made have amounted to 9d. per 1000 cubic feet. The leakage has been also considerably reduced. For the past year, the total income was £6033, of which £5398 was derived from the sale of gas and £517 from residuals. In the preceding year, the revenue from gas was £5159; and from residuals, £510. The profits last year were £1208, against £1176 in the preceding year. The Chairman stated that the Directors were watching the process of oil enriching.

Mr. Jesse Hall, the Manager of the St. Andrews Gas-Works, one of the "grand old men" of the Scotch gas industry, was to-day one of two defenders in actions which were tried by jury in the Court of Session in Edinburgh; and his many friends will be disappointed to hear that he has been unsuccessful. The pursuer was Provost Paterson, of St. Andrews. He and both defenders are governors of Madras College, a higher class school; and the dispute which arose was founded on statements made by the defenders in public meeting during a municipal election, to the effect that the Provost had said at the College Board, when a proposal was made to introduce pupils from the public elementary schools to the College, that those children would contaminate the genteel children attending the College. The Provost said this was an absolute contortion of the words used by him; and that the statements had turned the feelings of the people against him. He asked £500 against each of the defenders, as damages for slander. The jury took the side of the pursuer, and awarded him £20 against each. In the witness-box, Mr. Hall stated that he and the Provost had not been on speaking terms for five or six years. Some of your readers may remember that about that time Provost Paterson, who was a Director of the St. Andrews Gas Company, headed a movement for the transfer of the Company's undertaking to the Corporation, and that in connection with it there was a litigation arising out of Mr. Hall's refusal to allow the Provost to examine the books of the Company. The Provost was successful in that action; but the transfer was not proceeded with. Apparently, however, the feelings which were then engendered have never subsided; and the present action may have arisen out of these. The other defender was the Chairman of the Gas Company, who was also on the same side with Mr. Hall in the first litigation.

The order recently secured by Messrs. G. H. Nicoll and Co., of Dundee, for twenty "Main" gas cookers for use in the cookery classes instituted by the Dundee School Board, has been completed, and the stoves are now ready for distribution among the various schools. All the parts of the cookers are of steel, which is enamelled in order to keep it from rusting; while the internal fittings are removable.

Sulphate of ammonia is quoted at from £12 5s. to £13 5s. per ton, for immediate delivery.

The Glasgow Water Commissioners on Thursday adopted their annual accounts. Out of the balance of £45,838, they added £36,151 to the sinking fund, and carried forward £9656. Bailie Guthrie stated that during the year they had expended £199,000 upon new works, and that in the current year they expected to lay out even more. The total amount expended upon the augmentation works now in progress was upwards of £720,000; and since those works began, in 1883, the domestic water-rate had been twice reduced 1d. per pound. In the same time, the Commissioners have expended in interest and sinking fund upon unproductive new works a sum of £88,000.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 22.

Sulphate of Ammonia.—The market has continued to rule very firm; and there has been no lack of orders, as the shipments clearly indicate. There is great scarcity of supplies; and hence, it is needless to say, transactions show enhanced values, and it is difficult to see how the requirements are to be satisfied. The closing quotations are £13 6s. 3d., Hull; £13 7s. 6d., Leith; £13 3s. 9d. to £13 5s., Liverpool—with a hardening tendency; while for delivery October-March, f.o.b. Leith, sales have taken place at £12 5s. Nitrate has eased a little on spot; and 9s. 9d. is now quoted. There has recently been a large business done in cargoes for autumn shipment, at 9s. to 9s. 3d.; and there is a distinctly better tone in this commodity.

LONDON, *July* 22.

Tar Products.—The tendency of these seems to low figures. There appears to be no inquiry for 90's benzol; and 50's rule from 1s. 4½d. to 1s. 5d. Even at these prices, buyers do not seem at all anxious to cover their requirements far ahead. The difference in price between 90's and 50's has disappeared, and a sale of 90's is reported at a lower price than 50's. Tar acids and disinfectants have improved somewhat during the past week. More business has been done, and at slightly higher prices for forward delivery. Pitch maintains its position; and deliveries against contracts are being fully called for. To-day's prices may be taken as follows: Tar, 12s. 6d. Pitch, 23s. Benzols, 90's, 1s. 4½d.; 50's, 1s. 4½d. Solvent naphtha, 1s. 0½d. Toluol, 1s. 5d. Crude benzol naphtha, 30 per cent., 7⅞d. Creosote, 1d. Creosote salts, 16s. Carbolic acid, 60's, 1s. 8d.; 70's, 2s.; crystals, 6½d. Cresol, 1s. 8½d. Anthracene, nominal, 30 per cent. "A," 1s.; "B," 8d.

Sulphate of Ammonia continues to improve; and £13 7s. 6d. is about to-day's price, with buyers anxious to cover requirements over the next month or two. Gas liquor tells at 9s. to 10s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The refusal of the representatives of the Miners' Federation at the conference with the Committee of the Federated Coalowners in London on Friday to accept any reduction in wages, or refer matters in dispute to arbitration, has rendered a general stoppage of the pits throughout this and other districts inevitable, when the notices to terminate contracts expire during the present week. Although a strike for some time past has been practically certain, there has been no great excitement in the coal trade until towards the close of last week; but within the last few days a great rush of buying has come forward for all descriptions of fuel suitable for steam, forge, and general manufacturing purposes—consumers being eager to purchase, even at considerably advanced prices, to cover their requirements over the next one or two months. The leading colliery firms in the Manchester district have so far not actually advanced their list rates to regular customers, who are taking only their ordinary supplies; but for extra quantities, they are quoting advanced prices, and are declining to entertain any business at all from new customers. In many cases, the whole of the stocks they now hold in the lower qualities of coal and fuel have been practically sold, for delivery over the next month or six weeks; and the only available stocks of any quantity now at the pits consist of seconds and better qualities of round coal. In outside districts, there has been a practically general hardening-up of prices, upon all the lower qualities of round coal, for iron making, steam, and general manufacturing purposes, of quite 1s. 6d. to 2s. per ton; while engine fuel, which is excessively scarce, and likely to be still more so when the operations at the pits are actually stopped, has in many instances advanced 2s. 6d. to 3s. per ton. For house-fire requirements, there has not been any extreme pressure of demand; but the orders coming forward have in most cases been something like double what they have been during the very quiet time recently, and the stocks held in the yards are being rapidly filled up. So far as prices can be quoted, they now average about 11s. 6d. to 12s. per ton for best Wigan Arley coals; 10s. to 10s. 6d. for Pemberton four-feet and seconds Arley; common round coals of all descriptions ranging from 7s. 6d. up to 8s. 6d. per ton; through-and-through coal, which is being largely used in place of burgy and slack, 7s. 6d.; and slack, about 7s. for common to 7s. 6d. for best qualities—at the pit mouth. As to how long the strike is likely to continue, there are, of course all sorts of opinions; and in some quarters it is more than hinted that considerable defections on the part of employers are not at all unlikely. This may tend to render any very determined or protracted insistence upon the full extent of the reduction improbable. Taking, however, the principal colliery owners throughout this district, a firm and united feeling seems to prevail; but in one or two quarters it is not unlikely there may be some breaking away. How this is likely to affect the question, however, remains to be seen; but a very protracted strike is not generally considered probable.

Northern Coal Trade.—A fuller demand for coal has generally shown itself in the last few days, in view of possibilities of stoppage of some part of the national coal supply. But there has been for some weeks preparation for it, in the way of laying in stocks; and this has kept down the excitement. Best Northumbrian steam coals are in full demand; and the supply is well taken up. Old contracts claim most of the output; but for the small amount that has not been contracted for, higher prices are asked. Best steam is quoted at 10s.; second qualities, at 9s.; and small steam, at 3s. 6d. per ton f.o.b. Gas coal is firm, at from 6s. 9d. to 7s. per ton f.o.b. But here again the bulk of the output is taken up by contracts; and in one case a large producer has withdrawn his offers till some actual decision has been arrived at. Manufacturing coal is steady; and some users have been able to accumulate large stocks. Prices vary according to time of delivery. Coke is firm; and where early delivery can be guaranteed, rather higher prices are obtainable—15s. per ton f.o.b. Gas coke is steady. Fuel of all kinds is being shipped more freely; and this will minimize the effect of a stoppage, should it occur.

Scotch Coal Trade.—This being holiday week over a wide area of Scotland, the coal trade has been practically suspended. Coalowners are inclined to be firm, in the expectation of demands from England should the dispute there go on. For the same reason, the miners are disposed to hold out for a rise in wages; and to this end they are endeavouring to procure a uniform restriction of the output. There does not, however, seem to be any increase of unanimity among them. Prices may be taken as the same as last week. Shipments again show a decrease. The total for the week was 141,081 tons—a decrease of 12,887 tons as compared with the preceding week, and of 21,189 tons as compared with the corresponding week of last year. For the year to date, the total shipments have been 3,571,195 tons—a decrease of 399,862 tons compared with the corresponding period of 1892.

The Position of the Employees of the Birmingham Corporation.—In pursuance of a resolution passed by the Birmingham City Council, the General Purposes Committee have issued a return showing the hours, wages, overtime, and holidays of the employees in the different departments of the Corporation, and the additional cost which the adoption of a uniform week of 53 hours would entail. We learn therefrom that the number of men at the gas-works varies; but more are employed than in any other department. The wages of gangers range from 34s. to 35s. a week; stokers, from 5s. 3d. to 5s. 9d. per eight-hour shift; lid cleaners, 4s. per shift; coke loaders, 3s. 9d. per day; purifier men, 5s. per day; strikers, from 3s. 4d. to 3s. 6d.; shunters, 3s. 8d.; lamplighters, 3s. 8d.; and fitters, from 4s. 4d. to 4s. 8d.—all per day. In many cases there are no fixed hours. The Water Committee employ 259 men, whose wages range from 10s. to 50s. per week; their hours being from 48 to 56. After full inquiry, the Committee have arrived at the conclusion that the conditions of employment of the servants and workpeople under the Corporation, having regard to all the circumstances, will compare favourably with those of the employees of other corporations or other employers of the same class of labour; and that the hours appear to have been taken into account in fixing the wages, holidays, &c.

The Public Lighting Question at Grimsby.—The action of the Grimsby Town Council in discontinuing the lighting of the public lamps, to which reference was recently made in the JOURNAL, continues to be criticized in the local press. It appears that on the night of the 8th inst., as well as on the following Monday, Tuesday, and Wednesday, the inconvenience was specially keenly felt. Astonishment is expressed that members of a body entrusted with the management of public affairs, and therefore responsible for the public safety, can pretend that the streets are safe under the existing conditions. One enterprising councillor—a theatre and hotel proprietor—leaves a lamp alight all night in front of both establishments. But we learn that while this has the effect of "raising the pall of darkness for a few hundred yards, it serves to deepen the gloom on either side of the lighted area by contrast; and one can see how really dark the streets are after passing from the little area that is lighted." The possibility of an accident occurring has raised the question of the Corpcration's responsibility; and it is to be hoped nothing may occur, before the resumption of the public lighting, to cause this to be tested in the Courts.

Colne Valley Water Company.—In the report to be presented by the Directors of this Company at the half-yearly meeting on the 1st prox., they state that in the six months ending the 30th ult. the sum of £861 was expended on capital account in extension of mains, &c. Terms have been arranged with the Central Middlesex Water Company for the purchase, for £10,250, of the right to supply a portion of that Company's district, including the hamlets of Sudbury and Alperton in the parish of Harrow, together with the mains already laid in those districts, as well as the service reservoir on Wembley Hill, which holds about 500,000 gallons of water. A contract has recently been entered into with Messrs. Docwra and Son for constructing a new well and headings at the pumping-station at Bushey. This work has become necessary owing to the continued increase in the consumers. During the past half year, the number of new supplies laid on represents an addition of nearly £500 a year to the revenue. In order to provide the funds for the above, and for the future necessary requirements of the Company, the issue of additional capital will have to be authorized by the shareholders. The net profit for the half year was £4217; showing the satisfactory increase of £461, as compared with the corresponding period of 1892. The balance to the credit of the dividend and interest account is £2572, out of which the Directors recommend a dividend at the rate of 3½ per cent. per annum; leaving £332 to be carried forward.

Rival Water Schemes at Glossop.—A special meeting of the Glossop Town Council was held last Wednesday, to consider the water supply for the borough. A letter was read from the Mayor (Mr. W. S. Rhodes) stating that he was entirely opposed to Captain Partington's scheme, which, in his opinion, meant ruin to Glossop. Captain Partington moved that the Council should take immediate steps to increase the water supply; and he suggested that a new compensation reservoir should be built in the Shelf Valley, at an estimated cost of £10,000. Alderman J. Buckley seconded the motion. Mr. H. Rhodes stated that water could be obtained from the Manchester Corporation at a much cheaper rate than by building a new reservoir; and he proposed an amendment that the two schemes should be referred to two engineers to decide which was the better and cheaper. The Corporation could not supply Hadfield with water without interfering with Lord Howard's water rights; and if they purchased the Hadfield Water-Works from his Lordship, it would mean a further expenditure of £11,000. A competent engineer had stated that Captain Partington's scheme could not be carried out for less than £25,000. Both schemes were discussed at some length. On a vote being taken, Captain Partington's scheme was carried by 11 votes to 7; whereupon Mr. Rhodes said the Mayor authorized him to state that he resigned his position as Chairman of the Water Committee, and that he would oppose the scheme when it came before Parliament.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 163.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Apl.	10½	Alliance & Dublin 10 p. c.	10	15½—17½	..	6 0 0
100,000	10	"	7½	Do. 7 p. c	10	11½—12½	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	102—104	..	4 16 2
100,000	20	31 May	8	Bahia, Limited	20	10½—11½	..	13 18 3
200,000	5	12 May	6½	Bombay, Limited	5	5½—6	..	5 8 4
40,000	5	"	6½	Do. New	4	3¾—4¼	..	6 2 6
380,000	Stck.	24 Feb.	11½	Brentford Consolidated	100	222—227	..	5 1 4
180,000	"	"	8½	Do. New	100	168—173	..	4 18 3
220,000	20	15 Mar.	11½	Brighton & Hove Original	20	41—43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	104—107	..	4 13 5
320,000	20	13 Apl.	11½	British	20	42—44	..	5 4 7
50,000	10	15 Mar.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	"	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	—	—	Buenos Ayres (New) Limited	10	6¼—6¾	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	97—100	..	6 0 0
150,000	20	13 July	8	Cagliari, Limited	20	25—27*	..	5 18 6
550,000	Stck.	28 Apl.	12½	Commercial, Old Stock	100	243—248	..	5 0 10
165,000	"	"	9½	Do. New do.	100	185—190	+3	5 0 0
160,762	"	15 June	4½	Do. 4½ p. c. Deb. do.	100	125—130	..	3 9 3
800,000	Stck.	15 June	13	Continental Union, Limited	100	227—232	..	5 12 0
200,000	"	"	10	Do. 7 p. c. Pref.	100	190—195	..	5 2 7
75,000	Stck.	15 Mar.	10	Crystal Palace District	100	190—195	..	5 2 7
486,090	10	27 Jan.	10	European, Limited	10	21½—22¼	..	4 8 11
354,060	10	"	10	Do. Partly paid	7½	15½—16¼	+½	4 12 11
5,596,560	Stck.	10 Feb.	12	Gaslight & Coke, A, Ordinary	100	225—230	..	5 4 3
100,000	"	"	4	Do. B, 4 p. c. max.	100	95—99	..	4 0 10
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	263—268	..	3 14 7
30,000	"	"	5	Do. F, 5 p. c. Prf.	100	120—125	..	4 0 0
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	175—180	..	4 3 4
1,300,000	"	"	7	Do. H, 7 p. c. max.	100	170—175	..	4 0 0
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	262—267	..	3 14 10
476,000	"	"	6	Do. K, 6 p. c. Prf.	100	157—162	..	3 14 1
1,061,150	"	15 June	4	Do. 4 p. c. Deb. Stk.	100	125—128	..	3 2 6
294,850	"	"	4½	Do. 4½ p. c. do.	100	128—132	..	3 8 2
908,000	"	"	6	Do. 6 p. c. do	100	170—175	..	3 8 8
3,800,000	Stck.	12 May	12	Imperial Continental	100	220—225	..	5 6 8
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	4 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	103—105	..	4 15 3
541,920	20	15 June	5	Monte Video, Limited	20	13—14	..	7 2 10
150,000	5	31 May	10	Oriental, Limited	5	7½—8	..	6 5 0
60,000	5	29 Mar.	7	Ottoman, Limited	5	4¼—4⅝	..	7 3 8
166,870	10	—	2	Pará Limited	10	2—2½	..	—
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
150,000	10	28 Apl.	5	San Paulo, Limited	10	8½—9½	..	5 5 3
500,000	Stck.	24 Feb.	15½	South Metropolitan, A Stock	100	297—302	..	5 2 8
1,350,000	"	"	12	Do. B do.	100	243—247	−1	4 17 2
230,000	"	"	13	Do. C do.	100	250—255	..	5 1 11
750,000	"	13 July	5	Do. 5 p. c. Deb. Stk.	100	147—151*	..	3 6 2
60,000	Stck.	15 Mar.	11½	Tottenham & Edm'nton, "A"	100	215—220	..	5 4 6
				WATER COMPANIES.				
744,897	Stck.	29 June	10	Chelsea, Ordinary	100	259—264	+2	3 15 9
1,720,252	Stck.	29 Mar.	8	East London, Ordinary	100	205—210	+2	3 16 3
544,440	"	29 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	..	3 2 11
700,000	50	15 June	8½	Grand Junction	50	108—111	+1	3 16 7
708,000	Stck.	10 Feb.	11	Kent	100	280—285	..	3 17 2
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	100	235—240	+2	3 19 2
406,200	100	"	7½	Do. 7½ p. c. max.	100	195—200	..	3 15 0
310,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	129—132	..	3 0 7
500,000	100	10 Feb.	12½	New River, New Shares	100	329—334	..	3 12 8
1,030,000	Stck.	27 Jan.	4	Do. 4 p. c. Deb. Stk	100	133—137	..	2 18 5
902,300	Stck.	15 June	6	S'thwk & V'xhall, 10 p. c. max.	100	148—153	+1	3 18 5
126,500	100	"	6	Do. D 7½ p. c. do.	100	140—145	..	4 2 9
1,155,066	Stck.	15 June	10	West Middlesex	100	253—258	..	3 17 6

*Ex Div

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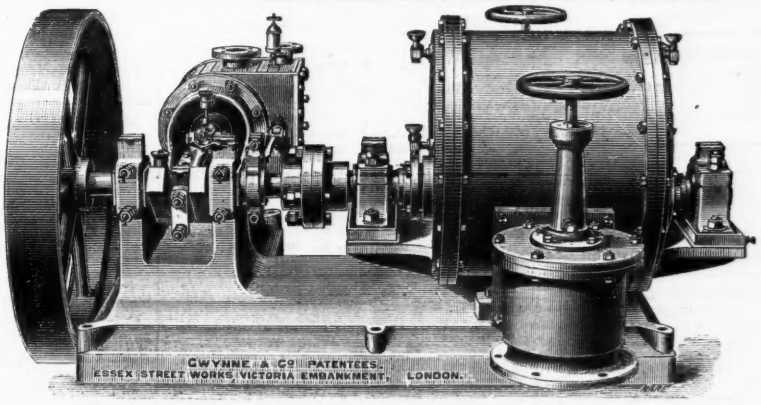

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MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

LIQUOR, Tar, and Spent Oxide wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

CORPORATION OF NELSON.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of a GAS EXHAUSTER to pass 60,000 cubic feet per hour.
Further Particulars and Form of Tender can be obtained from the Gas Engineer, Mr. W. Foster.
Tenders to be sent to the undersigned not later than the 9th day of August next.
R. M. PRESCOTT,
Town Clerk.
Town Hall, Nelson,
July 18, 1893.

TO GAS-WORKS CONTRACTORS.

THE Metropolitan Asylums Board are prepared to receive TENDERS from persons willing to Contract for the Erection of additional RETORTS at the Gas-Works at the Leavesden Asylum, near Watford, Herts, and for other Works in and about the Retort-House, in accordance with Plans and Specifications prepared by Mr. Frank Livesey, of the South Metropolitan Gas Company.
Plans and Specification may be inspected at the Chief Offices of the Board, Norfolk House, Norfolk Street, Strand, W.C., on and after Monday, the 24th inst.
Sealed Tenders are to be delivered at the Offices of the Board, Norfolk House, Norfolk Street, Strand, W.C., endorsed "Tender for Gas-Works, Leavesden Asylum," not later than Five p.m. o'clock on Tuesday, the 1st of August, 1893.
The Managers do not bind themselves to accept the lowest or any tender.
By order,
T. DUNCOMBE MANN,
Clerk to the Board.
Norfolk House, Norfolk Street,
Strand, W.C., July 21, 1893.

MANCHESTER CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the PURCHASE and REMOVAL of the AMMONIACAL LIQUOR to be produced at the Gaythorn, Rochdale Road, and Bradford Road Gas-Works during a period of one or more years, commencing at Noon on the 30th day of June, 1894.
The Committee do not bind themselves to accept the highest or any tender.
Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Ammoniacal Liquor," must be delivered at the Offices of the Gas Department, Town Hall, on or before Monday, the 4th of September, 1893.
Forms of tender and further particulars may be obtained on application—in writing only—to Mr. Charles Nickson, Superintendent of the Department.
A deposit of one guinea (which will be returned on receipt of the tender) must accompany each application for a tender form.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
July 21, 1893.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for One Year, from the 14th day of October next.

Delivery on Company's Works, filled into Purchaser's Tanks or in Barges alongside Works.

Payment, cash monthly.

Sealed tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Thursday, the 31st of August next; but the Directors do not bind themselves to accept the highest or any tender.

By order,
W. A. PADFIELD,
Secretary.

LEEK IMPROVEMENT ACT, 1855.

TO TAR DISTILLERS AND OTHERS.

TENDERS are invited for the purchase of the surplus GAS TAR produced at the Leek Gas-Works, for One, Two, or Three years, from the 1st of July, 1893, at per ton of 2240 lbs. at such Works.

Endorsed tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leek, by Four o'clock in the Afternoon of Monday, the 31st of July inst.

Forms of Tender and further Particulars may be obtained from the undersigned.

The highest or any tender will not necessarily be accepted.

By order of the Commissioners,
C. HENSHAW,
Clerk.

Town Hall, Leek,
July 20, 1893.

BOROUGH OF DEWSBURY.

THE Lighting and Water Committee of the above Corporation invite TENDERS for the supply and delivery during the Twelve Months ending the 31st day of August, 1894, of—

(1) SULPHURIC ACID.
(2) WET AND DRY GAS-METERS.
(3) CAST-IRON GAS-PIPES.

Specifications and Forms of Tender may be obtained on application to the Gas Engineer, Mr. Charles A. Craven, Gas-Works, Savile Town, Dewsbury.

Tenders, under sealed covers, endorsed "Sulphuric Acid," "Meters," or "Cast-Iron Pipes," as the case may be, to be sent to me not later than Saturday, the 29th inst.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
E. MAWDESLEY,
Town Clerk.

Town Hall, Dewsbury,
July 21, 1893.

SUTTON-IN-ASHFIELD LOCAL BOARD.
(GAS DEPARTMENT.)

SUPPLY OF GAS COAL.

THE Gas Committee of the above Local Board are prepared to receive TENDERS for the supply of 2400 tons of well-screened GAS COAL, to be free from Shale and Pyrites, and to be delivered at the Railway Town Station, Sutton, in such quantities as the Manager shall from time to time direct, between Sept. 1, 1893 and June 30, 1894.

Particulars may be obtained on application to Mr. A. Clarke, Gas-Works, Sutton-in-Ashfield, Notts.

Tenders, stating Price, to be addressed to Mr. A. Clarke, Gas-Works, Sutton-in-Ashfield, and marked "Tender for Coal," so as to arrive not later than Tuesday, the 2nd of August, 1893.

By order,
G. H. HIBBERT,
Clerk to the Committee.

Local Board Offices, Sutton-in-Ashfield, Notts.

UXBRIDGE AND HILLINGDON GAS CONSUMERS' COMPANY.

TO TAR DISTILLERS.

THE Directors are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works during the ensuing Twelve Months from the 1st of September next.

The quantity will be about 33,000 gallons, and will be delivered free into the Contractor's Barges alongside the Works, on the Grand Junction Canal.

Tenders, endorsed "For Tar," and addressed to the Chairman, must reach the Gas Company's Offices, High Street, not later than Saturday evening, Aug. 5.

The Directors have no special Form of Tender; and do not bind themselves to accept the highest or any tender.

Further and all particulars may be obtained of the undersigned.

S. PENNY, Assoc.M.Inst.C.E.,
Engineer and Manager.

Uxbridge, Middlesex,
July 17, 1893.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the ORDINARY GENERAL MEETING of the Proprietors of the above Company will be held at the Company's Offices, North Street, Wandsworth, on Thursday, the 10th of August next, at Five o' clock in the Evening precisely, for the purpose of a Declaration of a Dividend, and the transaction of the General Business of the Company.

The Transfer Books will be closed on and from the 28th of July, till the 10th of August, both days inclusive.

By order,
WALTER CROMARTY,
Secretary.

Offices: North Street,
Wandsworth, July 21, 1893.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that a Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at this Office, on Friday, the 4th day of August next, at Twelve o'clock Noon precisely, to transact the usual Business, including the Declaration of a Dividend for the Half Year ending on the 30th day of June last.

Notice is hereby also given, that at such Meeting the Directors will submit to the Proprietors, for their approval, a RESOLUTION determining the remuneration of the Secretary and General Manager, in accordance with the Provisions of The Companies Clauses Consolidation Act, 1845, and also a RESOLUTION with reference to a retiring allowance to the late Secretary and General Manager.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., July 19, 1893.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Bridge House Hotel, London Bridge, in the Borough of Southwark, on Wednesday, the 16th day of August next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ending the 30th of June last, and to Declare a Dividend for the same period.

The Transfer Books will be closed from the 2nd day of August until after the Meeting.

By order,
FRANK BUSH,
Secretary.

Offices: 709A, Old Kent Road, S.E.,
July 22, 1893.

PUBLICATIONS

ISSUED BY

WALTER KING,

11, BOLT COURT, FLEET STREET, LONDON, E.C.

ALL PARCELS SENT CARRIAGE FREE.

ANALYSIS OF THE ACCOUNTS OF THE METROPOLITAN WATER COMPANIES.—Issued Annually, as compiled and arranged by ALFRED LASS, F.C.A. Twelfth year, 1891-92, price 15/-. Previous volumes still on sale.

HANDBOOK FOR GAS ENGINEERS AND MANAGERS. — By THOMAS NEWBIGGING, M.Inst.C.E. Fifth Edition, enlarged, and illustrated by 193 engravings. Prices: Bound in morocco, gilt edges, 18/-; cloth, 15/-.

CONSPIRACY AND PROTECTION OF PROPERTY ACT.—It is required, under a Penalty of FIVE POUNDS, that a printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat. Printed copies of this section, in large type, on broad sheets, price 2/- per dozen, or 10/6 per 100. The Act extends to Scotland and Ireland.

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WITH OR WITHOUT
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A DISCUSSION
BETWEEN
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By F. SOUTHWELL CRIPPS.

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WALTER KING, Office of the "Journal of Gas Lighting," &c.,
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Seventeenth Annual Issue. 5s.
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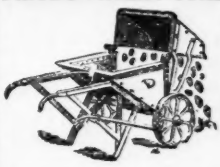

effecting a great saving of time labour, and expense.

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Prices are Reduced.

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Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.

Is cheap and easily fixed to any form of main.

Will be found the most efficient appliance of the kind yet introduced.

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GAS-FURNACES use our Special Derbyshire **GANNISTER BRICKS.**

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OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

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JAMES OAKES & Co.,

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AND

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Manufacture and keep in Stock at their Works
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PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

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MARQUIS OF LONDONDERRY'S COLLIERIES,

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Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
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NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,

for

CANNEL & COAL

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

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HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1½ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

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THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.

Yield of Coke: 13½ cwt.

Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

G. WALLER & Co.'s NEW PATENT GAS EXHAUSTER

MADE WITH FOUR BLADES,

To pass 300,000 Cubic Feet per Hour, with or without Engine combined.

IN USE AND ON ORDER FOR OVER 100 WORKS,

AND EQUAL TO

5,340,000 CUBIC FEET PER HOUR.

SPECIAL ADVANTAGES:—

The Four-Blade Exhauster **PASSES 50 PER CENT. MORE PER REVOLUTION** than any One or Two Blade Exhauster.

It takes 27 per cent. less power than any Two-Blade Exhauster.

It gives a steadier Gauge than any other Exhauster.

One of our 150,000 feet per hour Patent Four-Blade Exhausters passes continuously **180,000** cubic feet per hour, driven by a **12-INCH STEAM CYLINDER.** No other Maker can give a similar result.

Model of Patent Exhauster sent for inspection.

Oldest Makers of Beale Exhausters for over 300 Works.

Patent Compensating Steam Governor, Special Tar and Liquor Pumps, Gas-Valves.

Washer-Scrubbers, with **WOOD CLUSTERS,** and Tar Extractor combined.

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FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

THE SILICA FIRE-BRICK COMPANY,
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MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY
Strongly recommended where EXCESSIVE HEATS have to be maintained.

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Prices and Analysis of all the Scotch Cannels on application.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.,
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

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HARTON COAL COMPANY,
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W. H. PARKINSON,
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A FIRST-CLASS CANNEL COAL,
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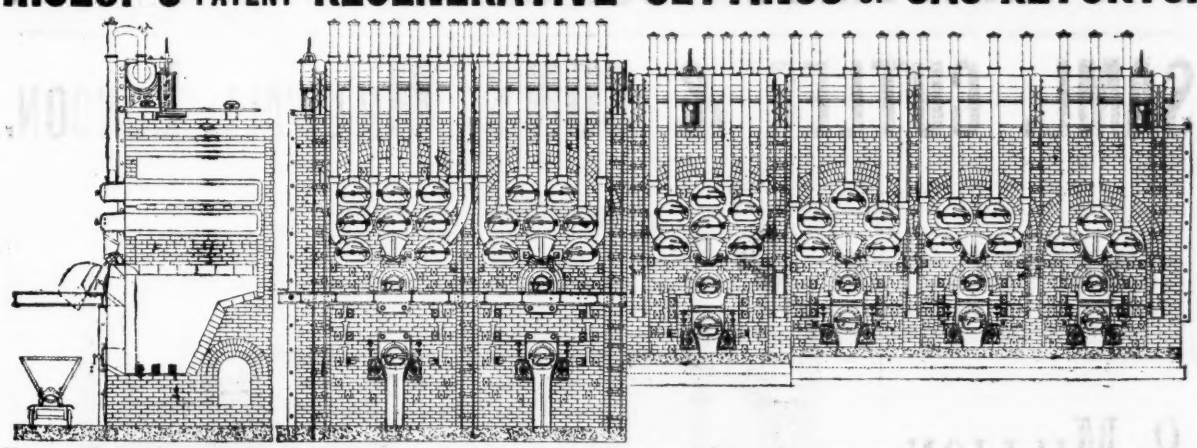
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS, AND HAVE ALREADY BEEN EXTENSIVELY ADOPTED. THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES.

THE SETTINGS HAVE ATTAINED TO A MEASURE OF SUCCESS AND POPULARITY QUITE UNEQUALLED BY THAT OF ANY OTHER WITHIN THE SAME SPACE OF TIME. THE WORKING RESULTS OBTAINED, AND THE GENERAL SATISFACTION GIVEN, ARE DECLARED IN EVERY CASE TO EXCEED, AND IN MOST CASES CONSIDERABLY EXCEED, THE PATENTEE'S GUARANTEE. THE CONSTRUCTION AND WORKING OF THE PATENT PRODUCER AND THE PATENT CHARGING APPARATUS FOR SAME ARE ABSOLUTELY UNIQUE AND UNRIVALLED, AND ARE THE DELIGHT OF EVERY STOKER; WHILE IN EVERY OTHER PARTICULAR THEY SECURE THE HIGHEST RESULTS ATTAINABLE BY ANY REGENERATIVE SYSTEM, AND AT A MINIMUM OF COST.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stewart Street, Shawlands Glasgow; J. E. FISHER, Stourbridge, and from R. F. HISLOP (son of Patentee), Gas-Works, Paisley.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non*
TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED, AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS
Under G. R. HISLOP'S PATENTS.

All Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.

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"CURLEY CANNEL."

YIELD: 15,306 CUB. FT. PER TON OF 30·62-CANDLE POWER.

SMOOTH CANNEL.

YIELD: 12,321 CUB. FT. PER TON OF 21·321-CANDLE POWER.

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CAST-IRON PIPES

FOR GAS AND WATER.

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VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS "PIPES GLASGOW."

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66, ROBERTSON STREET, GLASGOW.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

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BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF

WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM

BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF WARNER'S PATENT MARKET GAS STAND-PIPE.

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HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.

ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.

MAINTAINS A HIGH STANDARD IN RESIDUALS.

THE GRASSMOOR Co., Ld., CHESTERFIELD.

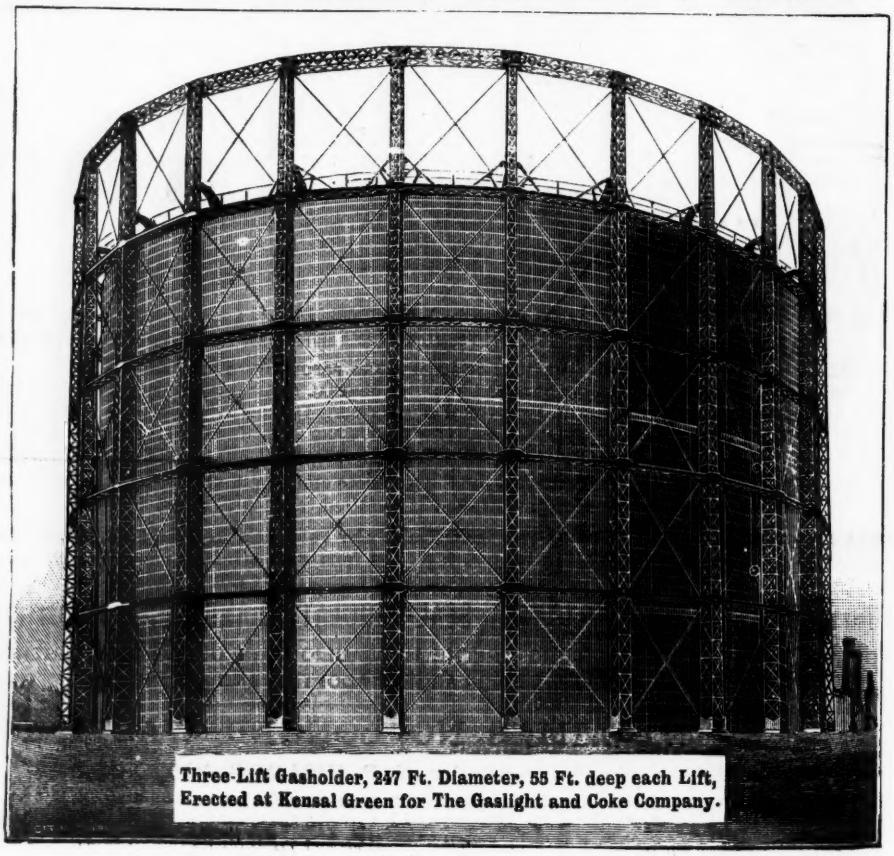
SAML. CUTLER & SONS, MILLWALL, LONDON.

NEARLY

8 MILLION

CUBIC FEET

CAPACITY.



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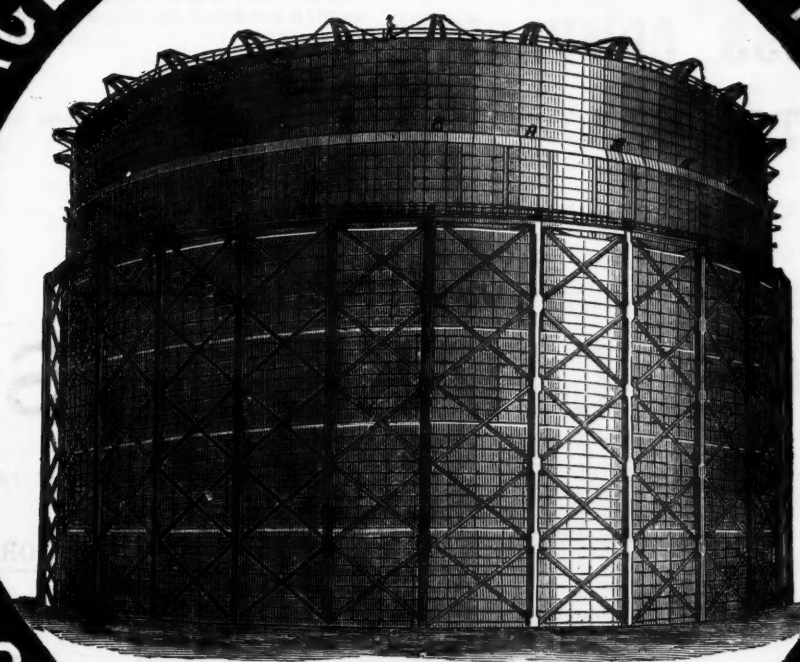

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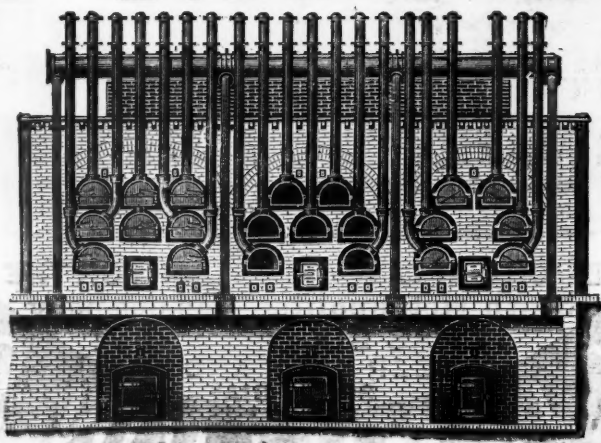

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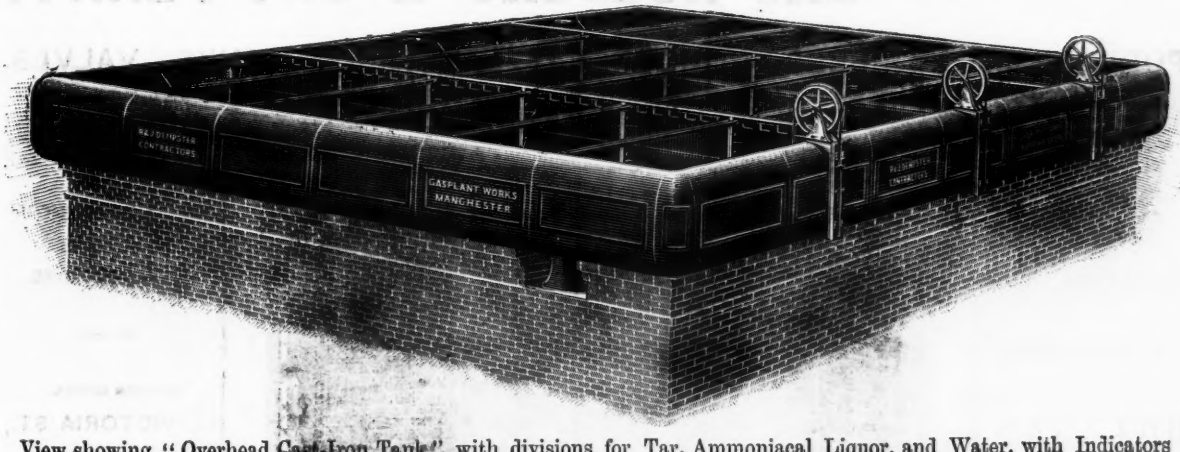

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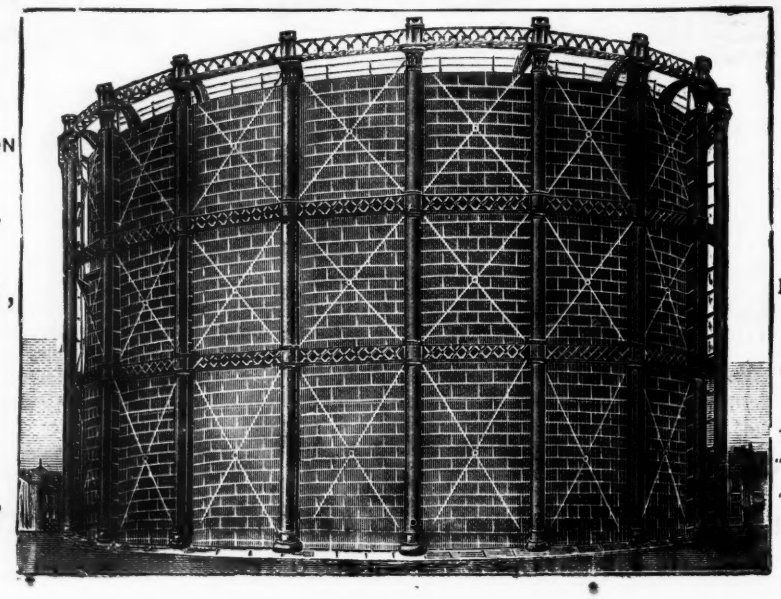

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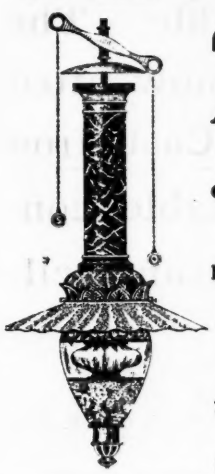

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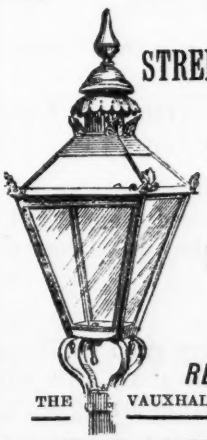

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See also Advt., p. 160.

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